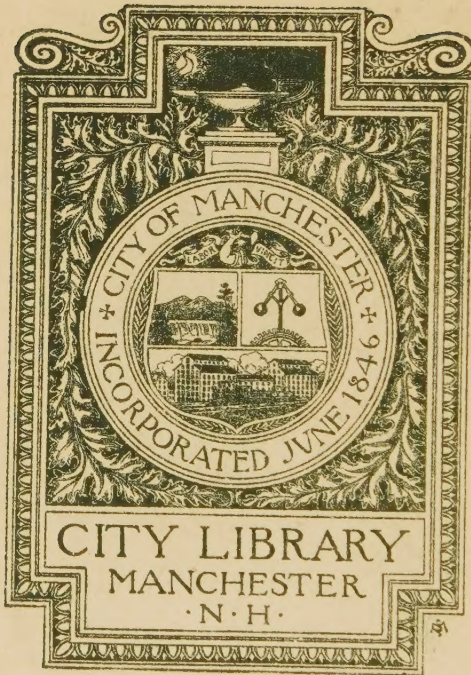




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The OFFICE APPLIANCE MANUAL

EDITED BY
WILLIAM HENRY LEFFINGWELL

MEMBER, THE TAYLOR SOCIETY AND THE SOCIETY OF INDUSTRIAL ENGINEERS;
ASSOCIATE OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

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EDITOR'S PREFACE

IN the attempt to assemble, in one place, knowledge which has never heretofore been in the possession of any one person, but widely scattered among many, the sponsors of this work, its publishers, and the authors of the text material have naturally been hampered by many inhibitions. The field of office appliances itself is all too new to afford any deep and settled convictions of an impartial character. Manufacturers, except in a few instances, have no very long experience to draw from, and the office as we now visualize it is but a decade old at most.

As a rule, office machines and appliances were originally invented and produced to satisfy a single need. Their field, however, gradually widened, by applications made by office managers of an inventive turn of mind, usually assisted by the service department of the manufacturer. Of the success of the original application there can, of course, be no doubt in those cases where the invention has persisted. But, regarding the value of many added applications, time and experience alone can tell.

The sponsors of the present volume, the National Association of Office Appliance Manufacturers, its publishers, and the manufacturers themselves, have provided amply for checks to prevent extravagant claims, and therefore in editing the material presented I was spared this burden.

It has been the aim of those responsible for the work to avoid controversial subjects and, with a theme so new and so fraught with possibilities for differences of opinion, this has been an extremely difficult task. In many cases I would personally have made more positive claims for appliances than were actually made by their manufacturers; in others, I have—by the exercise of considerable restraint—allowed

statements to stand with which I did not agree, rather than color them with my own opinions.

The volume represents, then, not the ultimate ideals of any one man—I include myself in this assertion—but a statement, as complete as possible, of the present condition of the art and trade.

And in view of this fact, I, as editor, feel it necessary to disclaim any responsibility for the opinions expressed therein, though I may truthfully state that I am in harmony with most of them. They should be regarded by the reader as a composite statement of the industry, and this fact he should never lose sight of.

In a few instances, the art of devising and producing office machinery and appliances has not progressed as rapidly as we engineers could wish. It is to be hoped that far-sighted manufacturers will search out these opportunities and supply the need.

The work, on the whole, is such a valuable contribution to office management literature that I am proud to have had a part in it, though the task of editing involved some very unusual characteristics. Office managers will find here a most valuable list of office appliances devised to satisfy every known office problem today, and in many cases they will doubtless find a large number of appliances that can be used for the same purpose. It is the duty of the office manager to apply the necessary analysis to the problem and to make the selection.

Still further, judging from the evolution of office appliances in the past, it is more than probable that some of these devices can be modified for use in other applications than the one they were devised for, and here, again, analysis is called for on the part of the office manager, who can assist the progress of the art by thinking out new applications for one or more of these extremely ingenious devices.

W. H. LEFFINGWELL

STATEMENT
OF THE
NATIONAL ASSOCIATION OF OFFICE
APPLIANCE MANUFACTURERS

THE volume of which this statement is a part was projected and sponsored by the National Association of Office Appliance Manufacturers.

The National Association of Office Appliance Manufacturers is composed of concerns in the industry which deal directly with the consumer through their own national organizations, and which can and do render a definite and specific service to the financial, mercantile, agricultural, and manufacturing industries.

The general purpose of the organization is to assist in the upbuilding of industry, the dissemination of useful and practical knowledge, and cooperation with the view of assisting the business man in improving practices in financial, industrial, and scientific fields by the utilization of modern devices and systems.

In line with this policy the Association sponsored, and assisted in, the publication of the "Office Equipment Catalogue," and, through a committee appointed for that purpose, supervised the material that was used in it. This same committee was given the responsibility of supervising and checking the material used in this volume.

It remained then only to receive the cooperation of the many manufacturers in the country producing office specialties to prepare, with their knowledge of their own industry, the material for use. This support has been generously given, so that in this publication the Association and the publishers are able to present a most comprehensive, complete, and valuable book, which, it is believed, will be well received everywhere.

The Association, through its committee appointed for the purpose, undertook to determine the policy to be followed in the general classification and preparation of the book. A great deal of time and effort has been put into it, and close cooperation has existed at all times between the publishers and the committee. The manuscripts, prepared by experts in various branches of the office appliance industry, have been most carefully compiled, and the information concerning modern devices which has been written into this book will be of great value to the entire business world.

Neither the publication committee nor the publishers assume any responsibility for the claims made for the numerous devices covered in this book. The manufacturers of those devices are fully capable of taking this responsibility, and stand ready to prove the various claims advanced. The committee, as well as the publishers, has gone to considerable effort to eliminate all sales propaganda and to present to the reader the basic principles and operations of the appliances offered by the various manufacturers.

It was decided in the preparation of this book that a description of all modern office appliances should be included, whether or not the concerns manufacturing them were eligible to membership in the Association. The Association desires to prepare a book that will be of value to every phase of industry and those responsible for the economical operation thereof.

The thought back of it all is that this book shall carry the information which the specialists in industry have been able to gather; that these concerns should present here the possibilities of their desires, and that the reader might, with this information, select the appliances as will most efficiently meet his specific problems.

The Association feels that this book will be the only authoritative publication of its kind, and that it will well serve the purpose for which it was conceived.

The membership of the National Association of Office Appliance Manufacturers offers the assistance of each mem-

ber in the development and furtherance of modern practice in industrial, agricultural, professional, and mercantile activities. Any member of the Association will be glad to render all service in his power at any time the opportunity may offer.

NATIONAL ASSOCIATION OF OFFICE APPLIANCE MANUFACTURERS

By GEORGE P. WIGGINTON,
Chairman, Publication Committee

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CONTENTS

I

THE PURPOSE OF THIS BOOK..... I

Three primary aims. Office procedure and efficiency emphasized.
How to find specific information.

II

HISTORICAL BACKGROUND OF OFFICE MACHINES, EQUIPMENT, AND SYSTEMS 4

The Industrial Revolution. One of the first labor-saving devices.
Early achievements in office machinery.

III

CLASSIFICATION OF OFFICE MACHINES AND SYSTEMS..... 9

Diversity of office machines. How a functional classification aids the reader. Why machines are classified as to functions.

IV

THE APPLICATION AND VALUE OF THE SYSTEMATIZATION IDEA IN BUSINESS 17

How the office appliance industry started. What is *systematization*? The seven elements of system. Application of systems, machines, and equipment in banks. (1) Handling deposit items: commercial deposits; savings deposits; bank deposits; systems that speed up work; machines and equipment increase efficiency. (2) Loan and discount activities: notes discounted; collateral loans; mortgage loans; bonds; systems; machines and equipment. (3) Meeting the problems of exchange: teller records; collections; transit items; keeping records of exchange; machines and equipment. (4) Trust department activities: corporate trust activities; individual trust activities; systems; machines and equipment. (5) Safe deposit: systems; machines and equipment. (6) General and administrative: systems; machines and equipment. Commercial institutions. Four functions of office routine: (1) Buying: placing the order; receiving and inspecting goods; recording value, quantity, and cost; paying. (2) Selling: order-writing; shipping; billing; accounting. (3) Administration. (4) Production. Public service corporations. Gas, electric, and water companies: order-writing; billing; systems and machines. Railroad, steamship, and express companies: passenger service; freight

service. Telephone and telegraph companies. Hotels and clubs. Institutions. Professions. Miscellaneous: brokers; insurance; municipal, county, state, and federal offices.

V

ADDING MACHINES 55

The quest for mechanical calculators began thousands of years ago. The adding machine serves one purpose, the calculating machine another. Early efforts to perfect an adding-listing machine. Later improvements. Points to be considered before buying. Principles of operation. How adding machines are classified. Features common to all. Straight adding machines: full-keyboard type; ten-key type. Duplex machines: full-keyboard type; ten-key type. Cutting corners in figuring.

VI

CALCULATING MACHINES 82

Why pad-and-pencil figuring is costly. An adding machine or a calculating machine? Ancestors of the modern calculator. How to select a calculating machine. Two types from which to choose. Key-driven calculators. Crank-operated calculators: key-set machines; lever-set machines. You can use a calculating machine in every department of your business.

VII

BILLING MACHINES 102

Antiquated methods are costly. The evolution of the billing machine. Select your machine with care. Three types available. Non-computing billers: cylinder machines; flat writing machines. Billing machines that add and subtract: cylinder machines; flat writing machines. Billing machines that have adding, subtracting, and multiplying mechanisms. Versatility of the billing machine. Systems which saved the other man's dollars.

VIII

BOOKKEEPING MACHINES 128

Why mechanical bookkeeping is replacing handwritten bookkeeping. Bookkeeping terms defined. Methods of posting: the dual plan; the combined plan. Methods of proof: old- and new-balance proof; checking against a predetermined total; proof-sheet method; split-platen method. Bookkeeping machines evolved from adding machines. Bookkeeping machines which combine writing, adding, and subtracting features. Bookkeeping machines of cash-register origin. How the bookkeeping machine serves business.

IX

ACCOUNTING AND TABULATING MACHINES..... 164

Importance of compiling facts. Origin of tabulating devices. Principles of operation. Accounting and tabulating equipment: cards; punching machines; sorting devices; tabulators. What accounting and tabulating equipment does for business.

X

CHECK PROTECTORS AND WRITERS..... 180

Every business needs check protection. Early attempts to protect checks. Three important features of check writers: protection; characters written; how written. How special features are combined: amount and payee's name protector; removable-type protector; general utility protector; numeral imprint and payee protector; diagonal-amount-line check writer; foreign-language check writer; two-color amount-line check writer; personal check protectors. The value of the check protector is inestimable.

XI

CHECK CERTIFIERS, ENDORSERS, CANCELERS, AND SIGNERS. 202

Need for such equipment. Check certifiers. Check endorsers: single feed endorsers; quantity feed endorsers. Check cancelers. Signature-writing devices. These appliances all save money.

XII

COIN-CHANGING DEVICES 211

The problem of making change is an important one. How the problem was solved. Features of the modern coin-changer: the coin tray; the keyboard; the coin chute; the split-change key. Types of coin-changers now on the market: the payer type; the changer type; a variation. How and where the coin-changers are used to great advantage.

XIII

COIN-HANDLING DEVICES 224

Savings effected by mechanical coin-handlers. Early stages of the coin-handling machine. Machines classified as to function. Coin separators. Coin-counting and packaging machines: bag-loading machine; proving and bagging machines; continuous counting and bagging machines; counting-machine heads; manual counters. Coin-counters and separators. Use of coin-handling devices universal.

XIV

AUTOGRAPHIC REGISTERS 248

Every transaction requires a record. The first step in the development of record-keeping. How autographic registers developed. Means of attaining alignment. Types and kinds of autographic registers in use today. The roll form type: the manifold; the roll recorder; the total summary. The flat packet type: the manifold; the flat packet recorder. Autographic register systems.

XV

AUTOGRAPHIC CASH REGISTERS..... 274

What the autographic cash register is. Important features of the autographic cash register. The two types of registers: automatic type; key release or plunger type. Advantages of autographic cash registers.

XVI

CASH REGISTERS 283

Old systems of recording cash transactions. Why such systems were inadequate. A merchant's invention. Characteristics of the modern cash register: indication; adding and counting mechanism; cash drawer and bell; keyboard; printed detail strip; printed receipt. Classification of modern cash registers. Non-printing type: key-set non-printer; lever-set non-printer. Printing type: total printer; detail printer; detail and receipt printer; detail-total printer; multiple accumulative total printer. The scope of the cash register field.

XVII

CREDIT REGISTERS 300

Accurate and up-to-date credit records a necessity. The first credit systems. Present-day credit register and systems: the daily-account type; the daily-past-account type. The value of credit register systems to business.

XVIII

ADDING MACHINE-CASH REGISTERS..... 312

Accurate bookkeeping methods for the retail store. Recent creation of the adding machine-cash register. Chief characteristics of the adding machine-cash register: the adding unit; the cash drawer. Two types available: the single printer; the duplicate printer. How transactions are recorded. These registers make record-keeping simple.

CONTENTS

xiii

XIX

ADDING MACHINE—CASH AND CREDIT REGISTERS..... 322

Advantages of handling cash and credit transactions in the same register. Two types of registers available. The combined unit type. The automatic combined unit type: the credit file selector; the individual credit tray selector. The combined register solves bookkeeping problems.

XX

DICTATING MACHINES 330

The need for the dictating machine. The early history of the dictating machine. Three units of the dictating machine system: the dictating machine; the transcribing machine; the shaving machine. Creating a dictating machine system: the transcribing department; cylinder shaving section; the dictator's system; time and record keeping. The uses and advantages of the dictating machine.

XXI

TYPEWRITERS 346

Ancestors of the modern typewriter. Present-day models. Four-bank typewriters: keyboard; shift keys; special keys; carriage; platens; type. Three-bank typewriters: keyboard; shift keys; special keys; carriage. Portable typewriters. The typewriter inspired other office equipment.

XXII

TYPING AIDS 366

Increasing typing efficiency. Copy-holders. Why your typist should use a copy-holder. The automatic envelope feeder. How the envelope feeder increases production.

XXIII

DUPLICATING MACHINES 374

The versatility of duplicating machines. The first machines for making multiple copies. The five kinds of duplicating machines. Stencil duplicators. Gelatin duplicators. Clay-composition duplicators. Duplicating machines which utilize the typesetting principle: machines which print from typewriter type; machines which print from printers' type. Automatic typewriters. The place of duplicating machines in business.

XXIV

PHOTO-COPYING MACHINES 399

What photo-copying machines will do. The machine and how it operates. Auxiliary equipment: electric lamps; dryers. Reasons for installing photo-copying apparatus.

XXV

ADDRESSING MACHINES 405

Hand addressing wastes time and money. Pioneers in the addressing machine industry. Attachments common to all types: automatic selector; cut-off; dater; duplicator; automatic ejector; gages; lister; hand spacer; numbering devices; repeater; skipper; signals; tag feeder; triplicator; quadruplicator; automatic envelope feed; mailer strip lister; proofer; town and route marker. How to select the right system. Three methods of printing. Metal plates the basis of three systems: address plates; embossing machines; addressing machines. Fiber stencils the basis of other systems: stencils; how the stencils are cut; addressing machines. Other machines print from type slugs: address slugs; linotype, intertype, or linograph machines; addressing machines. Addressing machines do more than address envelopes: marketing; recording; shipments; collections; disbursements; routing.

XXVI

MAILING-ROOM EQUIPMENT 451

Inefficient mailing-room methods retard business. A machine for every need. Mechanical envelope openers. Hand stamp affixers. Parcel-post machines. Sealing machines. Combined sealing and stamping machine. Permit, meter, and precanceled-stamp systems: metering-permit machines; non-metering permit machines; how precanceled stamps are used. Mailing equipment saves money.

XXVII

SHIPPING-ROOM AIDS 475

Assuring the safe arrival of shipments. Tape sealing machines: hand-operated sealers; semi-automatic sealers; automatic sealers. Wax sealing machines. Package-tying machines. Label-pasting machines. Label-moistening devices. Stencil-cutting machines. Stencil brushes. The value of shipping-room equipment.

XXVIII

SCALES 494

Early attempts to secure weight accurately. Two general divi-

sions. Office scales: computing postal scales; non-computing postal scales. Other scales which add to office efficiency: computing merchandise scales; non-computing merchandise scales; heavy-capacity scales. The importance of the scale in business.

XXIX

TIME-RECORDING DEVICES 510

Time control the basis of efficiency. Early experiments with time recorders. Features common to all time-recording devices: method of operation; imprint. A recorder for every purpose. Employees' time recorders: card recorders; dial recorders; autographic recorders. Time stamps: electric models; spring-wound models. Job-time recorders. Elapsed-time recorders. Money-time recorders. Recording door locks. Watchman's recording equipment: electric watchclocks; portable watchclocks. Program instruments. Service rendered by time recorders.

XXX

INTERCOMMUNICATING SYSTEMS 541

Rapid communication a necessity. Answering the demand for easy communication. The purpose of intercommunicating devices is twofold. Intercommunicating telephone systems: manual system; automatic system. Telephone attachments: voice silencers; holder attachments. Electric paging system. Electric alarm systems. The telegraph typewriter. Credit authorization systems: electric authorizing telephone; the telautograph. Mechanical messengers: wire-line carriers; cable carriers; pneumatic tube systems; belt conveyers. The scope of intercommunicating systems.

XXXI

MISCELLANEOUS OFFICE APPLIANCES..... 583

Automatic "ad"-stamper. Baling presses. Calculation stamps. Calculating rules. Counting machines. Coupon-printing machines. Envelope moisteners. Eyelet fasteners. Floor-scrubbing and polishing machines. Folding machines. Imprinting presses. Multiple stamps. Numbering machines. Paper-cutting machines: desk cutter; hand-lever cutter; motor-driven cutter. Paper punches. Perforating machines. Receipting-coupon cutters. Telephone indexes. Ticket-marking machines.

XXXII

SAFE-KEEPING RECORDS 615

Significance of business records. Three fundamental hazards. Value of the record. General specifications for safes. Vault protection. Storage and supply cabinets. Safety-deposit boxes. Value of protecting records.

XXXIII

FILING METHODS 639

Mere safe-keeping does not make records valuable. There are five basic methods of filing: Alphabetic filing. Numerical filing. Geographical filing: by state; by city. Subject filing: alphabetic subject file; numerical subject file; decimal subject file. Chronological filing. Operation. Follow-up or tickler systems: correspondence size; the card-follow-up. Transferring correspondence: duplicate equipment method; periodic transfer; maximum and minimum period transfer; perpetual transfer. Card records: the card ledger; sales records; stock records; credit records. Planning a central filing system.

XXXIV

FILING EQUIPMENT 671

Records must be properly housed. Filing cabinets: upright cabinets; counter-height cabinets; horizontal cabinets; vault trucks. Card cabinets and desk trays. Combination files. Card-record desks. Ledger desks. Ledger trays. Transfer cases. Steel storage shelving. Arch and board files. Supplies for paper filing: guides; folders. Card-record supplies: card guides; cards.

XXXV

VISIBLE INDEX SYSTEMS..... 696

Early experiments with visible record-keeping systems. Four types of visible indexes. Cabinet type: metal-hinged holders; wire holders; overlapping pocket; card carriers; die-cut or upstanding; slotted card holder; overlapping cut card. Vertical-visible or card drawer type. Upright type: rotating index; straight-track upright. Book-unit type. Book units combined with cabinets: one-way cabinet; two-way cabinet. Why visible indexes make records more valuable.

XXXVI

FINDING AND FILING DEVICES..... 719

Why mechanical filing devices are needed. Three distinct methods of selecting data: numerical selector; class-name selector; group segregator. Finding and filing problems solved.

XXXVII

OFFICE FURNITURE 729

Why your office should be comfortable and attractive. Desks: roll-top desks; flat-top desks; typewriter desks. Chairs. Tables. Bookcases. Lockers. Miscellaneous equipment; typewriter

stands; desk tops or pads; inkwells; desk trays; moisteners or sponge cups; lighting fixtures; pencil sharpeners. Proper furniture increases efficiency.

XXXVIII

LOOSE-LEAF ACCOUNTING RECORDS, EQUIPMENT, AND SYSTEMS	754
---	-----

The evolution of loose-leaf accounting records. From bound ledger to loose-leaf: bound ledgers; the first "Boston" ledger; card ledgers; loose-leaf ledgers. The first practical loose-leaf ledger. Importance of the loose-leaf idea to present-day business. Advantages of loose-leaf systems. Loose-leaf equipment. Binders: solid-post; sectional-post; chain-post; tubular-post; thong; telescoping-back; fixed-capacity; ring and prong. Paper. Loose-leaf systems. Loose-leaf indexing: numerical; alphabetic; geographical; indexing by route; subject filing; division leaves and tabs.

XXXIX

BILLING-MACHINE FORMS	803
---------------------------------	-----

Printed forms are used extensively. Cut forms. Continuous-length forms: roll forms; manifold forms.

ILLUSTRATIONS

1	Adding-machine keyboards	57
2	Pull-down lever keyboard adding machine.....	58
3	Adding-listing machine	59
4	Full-, high-keyboard straight adding machine.....	64
5	Electrically operated, full-, high-keyboard adding machine	65
6	Low-keyboard adding machine	66
7	Full-, low-keyboard, right-hand control adding machine	67
8	Ten-key adding machine.....	69
9	Ten-key adding machine with touch bar.....	73
10	Low-keyboard, hand-operated duplex adding machine	78
11	Early model key-driven calculator	84
12	Early model lever-set calculator	85
13	Early model key-set, crank-operated calculator	87
14	Typical direct key-driven depressible-key calculator..	90
15	Key-driven type of calculating machine	91
16	Key-set type of calculating machine	92
17	Key-set, crank-operated calculating machine	93
18	Key-set calculator with full keyboard and a special multiplying keyboard	94
19	Two types of electrically driven calculators	97
20	Calculator, lever-set, with moving carriage and crank ..	99
21	Non-computing billing machine, with carbon-changing device	104
22	Non-computing billing device for standard typewriters	106
23	Typewriter transformed into billing machine	108
24	Flat writing biller with backward and forward moving typing unit	111
25	Split cylinder billing and ledger-posting machine	113
26	Bookkeeping machine, with fan-fold biller attachment	115
27	Billing machine, with typewriter and calculating mechanism	117
28	Invoice form illustrating operation of billing machine	119
29	Full-keyboard type of adding and direct-subtracting bookkeeping machine	130
30	Ten-key bookkeeping machine with word-printing device	132
31	Ten-key bookkeeping machine with calendar levers ..	134
32	Bookkeeping machine with totalizers on carriage truck	136

33	Bookkeeping machine with stationary registers below typewriter keyboard	138
34	Ten-key combined adding-writing bookkeeping machine	148
35	Ledger and statement forms	155
36	Bookkeeping machine with flat writing surface	156
37	Bookkeeping machine of cash register origin	161
38	Pass-book and ledger card posted on bookkeeping machine	162
39	Typewriter-key-punch machine	165
40	Key-punch operated like a typewriter	166
41	Key-punch machine with depressible trip key	167
42	Sorting machine which arranges cards in classified sequence	170
43	Another automatic card-sorting machine	171
44	Tabulating machine	172
45	Accounting machine for auditing and analysis work ..	174
46	Printing tabulator machine	177
47	Mechanical type of printing tabulator	178
48	Check protector	182
49	Check protector with repeat device	183
50	Check writer with removable type feature	184
51	General utility check protector	186
52	Numeral imprint and payee check protector	187
53	Diagonal-amount-line check writer	188
54	Type of foreign-language check writer	198
55	Check writer using two colors, black and red	199
56	Personal check protector	200
57	Check certifier with serial numbering device	203
58	Check endorser	204
59	Single feed and quantity feed check endorsers for banks and large commercial houses	205
60	Check-canceling machine	207
61	Several forms of check cancelation	208
62	Coin-changing devices	216
63	Changer type of coin-changing device	218
64	Pay-roll coin-changing device	220
65	Pay-roll coin-changer, filling envelopes direct	222
66	One type of coin-handling and separating machine	226
67	Coin separator operated by gravity	227
68	Coin counting and wrapping machines	228
69	Motor-operated coin counting and packaging machine ..	229
70	Counting and packaging unit of coin separator	230
71	Hand-operated counting and wrapping machine	233

ILLUSTRATIONS

xxi

72	Coin-handling machine using continuous roll of paper for wrapping	234
73	Coin-handling, bag-loading device	235
74	Coin recounting and proving, and continuous counting and bagging machines	237
75	Electrically operated counting and bagging device ..	238
76	Coin stacker and tray in use	241
77	Counting and sorting machine with calipering device ..	244
78	Counting and separating machine handling five coin denominations	245
79	Counting and sorting machine, with handling capacity of 40,000 coins per hour	246
80	Autographic register	250
81	Type of early autographic register	252
82	Types of roll form registers	253
83	Manifolder, showing method of holding flat packet forms within register	255
84	Manifolder and flat packet register with lever device ..	257
85	Recorder register with locked compartment for secret record	258
86	How the lever-operated register retains record	259
87	Autographic register forms	260
88	Autographic form showing method of making out stock-room requisition	261
89	Different-colored paper furthers efficiency in autographic register method	262
90	Factory order systems handled with autographic register	263
91a	Record-keeping transactions simplified by autographic register system	264
91b	Autographic form in triplicate	265
92	Safeguarding securities by means of autographic register forms	266
93	Service performed by autographic register system in garages	267
94	Hospital records kept by autographic register system ..	268
95	Autographic register system form used by one Y.M.C.A.	270
96	How the autographic cash register is used	276
97	Types of autographic cash registers	278
98	Plunger type autographic cash registers	279
99	Optional receipt type total summary cash register ..	280
100	Differing types of autographic cash registers	281
101	Two steps in cash register development	284

102	Key-set and lever-set non-printing cash registers ..	285
103	Total-printer type of cash register	287
104	Detail printer cash register with autographic device ..	288
105	Cash register with detail and receipt-printing device ..	289
106	Detail-total printing cash register	291
107	Multiple accumulative total printer type of cash register	292
108	Daily-account type credit registers with metal-hinged leaves	302
109	Flexible-leaf type, visible index credit register	305
110	Interesting features in two credit registers	307
111	The daily-past-account type of credit register	310
112	Old and new way of listing and computing	314
113	Adding machine-cash registers of the single printer type	315
114	Duplicate printer adding machine-cash register	319
115	Another make of duplicate printer adding machine cash register	320
116	Types of the combined unit adding machine-cash and credit registers	325
117	Combined unit adding machine-cash and credit register with special features	326
118	Individual credit tray selector type of combination register	327
119	Early models of dictating, transcribing, and shaving machines	332
120	Simplified modern style of dictating machine	333
121	Convenient features of present-day dictating machine	335
122	Transcribing machine, with hand-pressure control ...	336
123	Transcribing machine, with foot-pressure control	339
124	Cylinder shaving machine	341
125	Simple process of cylinder shaving	343
126	Early types of writing machine or typewriter	347
127	Ancestor of the typewriter—Sholes patent, 1873	348
128	All parts of the present-day typewriter	349
129	Three- and four-bank typewriter keyboards	350
130	Typewriter platens for label- and card-writing	353
131	Typewriter that may be taken apart and units interchanged	355
132	Noiseless typewriter of pressure-printing principle ..	356
133	Electric-powered typewriter, with impression regulator	357
134	Wide carriage model of typewriter	358
135	Typewriter with type-wheel principle	360

136	Typewriter showing U-shaped, "down thrust" type-bars	361
137	Portable typewriter	363
138	Portable typewriter with special keyboard	363
139	Copy-holder with line-spacing mechanism	367
140	Another type of copy-holder with line spacing mechanism	368
141	Adjustable copy-holder with line indicator and leaf-holder	369
142	The automatic envelope feeder	372
143	Forms showing versatility of duplicating machine ..	375
144	Drawing table device for stenciling with stylus	376
145	Stencil duplicator embodying revolving cylinder	377
146	Method of attaching stencil to cylinder of duplicator	379
147	A small hand stencil duplicating device	380
148	Type of gelatin duplicator	381
149	Gelatin duplicator equipped with feeding tray	383
150	Duplicator using gelatin pad instead of gelatin-covered roll	384
151	Method of composing copy to be duplicated, also printing segment	385
152	Electrically operated typewriter keyboard composing machine	388
153	A duplicating machine which prints from typewriter type	389
154	Duplicator with printing ink attachment for office printing	390
155	Printing press duplicator using individual typewriter plates	391
156	Name and address slugs are fed by gravity into duplicating machine	392
157	Duplicating press on reciprocating bed and cylinder principle	393
158	Duplicating press for all standard type equipment ..	394
159	Automatic typewriter style of duplicator	396
160	Perforator, a unit of automatic typewriter duplicator	397
161	The photo-copying machine	401
162	Photo-copying apparatus for reproducing facsimiles at low cost	402
163	Zinc address plate	407
164	Metal address plates with name card attached	408
165	Linked aluminum, reel-wound address plates	409
166	Motor-operated metal-plate embossing machines	411
167	Hand-operated metal-plate embossing machine	412

168	Embossing machine with standard typewriter keyboard	414
169	Storage cabinet for type or linotype address galleys	415
170	Hand-operated addressing machine	416
171	Motor-operated, automatic feed addressing machine	422
172	High-powered automatic addressing machines	424
173	Address-plate and stencil housing cabinet	425
174	Stencil-cutting on typewriter	426
175	Stencil panel frames	428
176	Stencils showing data arrangement	429
177	Wrapper-printing machine	431
178	Space-saving arrangement of addressing machine and case	432
179	High-powered addressing machine	435
180	Galley of inked linotype slugs used with addressing machines	436
181	Adding machine using inked type slugs	438
182	Motor-operated addressing machine	440
183	Addressing machine equipped with tall magazine for holding plates	442
184	Addressing machine which can be converted into a form printer	445
185	Method of addressing on margins of newspapers or magazines	447
186	Mechanical envelope openers, hand and electric operated	453
187	Method of using hand stamp affixers	455
188	Stamp affixers equipped with locks	456
189	Parcel-post stamp machine receptacle for various stamp denominations	457
190	Hand-operated sealing machine	458
191	Two types of sealing machines: hand-operated and motor-driven	460
192	Sealing machine to handle permit mail or to seal mail with precanceled stamps attached	462
193	Printing and recording mechanism, basis of meter-permit system	464
194	Metering-permit machine	465
195	Indicia printed by non-metering type of permit machine, and metered-permit indicia	467
196	Electrically operated permit printing machine	468
197	Removable permit printing attachment of sealing-stamping machine	470
198	Sealing machine equipped with device for printing and cancelation	471

199	Mailing machine, with automatic feed, separation, im- printing, postmarking, and cancelation	473
200	Hand-operated semi-automatic tape sealing machine	477
201	Roller type of sealing machine	478
202	Moistening device featuring rubber-set brush in water tank	479
203	Automatic tape sealer with measuring dials and lever arm	481
204	Motor-driven tape sealer with indicator and two rolls tape	482
205	Wax-sealing machine	483
206	Package-tying machine	484
207	Automatic feeder model of package-tying machine ..	485
208	Hand-operated label-pasting machine	486
209	Label-moistening device	487
210	Stencil-cutting machines	488
211	Stencil-cutting machine, automatic	489
212	Stencil-cutting machine with punches and dies	491
213	Stencil brush	492
214	Computing office postal scales	496
215	Fan-type, computing parcel-post scales	497
216	Beam-arm, non-computing postal scale for light mail ..	499
217	Clock-face, dial type postal scale for sensitive weighing	500
218	Automatic dial type general purpose scales	501
219	Computing merchandise scale with visible double chart	503
220	Two non-computing scales: hanging balance type and heavy-duty industrial scale	506
221	Non-computing merchandise scales	507
222	Electric time system showing master clock and units	512
223	Time recorder imprints	513
224	Clock time recorder, and employees' attendance time card	514
225	Employees' time recorder	515
226	Dial time and pay-roll recorder for pay-roll sheet ..	516
227	Autographic attendance recorder	517
228	Electrically operated time stamps, master-clock con- trolled	523
229	Spring-wound, self-contained clock-controlled time stamp	524
230	Method of use of job-time recorder	525
231	Elapsed-time recorder for accurate job data	526
232	The money-time recorder means accurate cost data	529
233	Form record of recording door lock	530

234	Recording door lock prints on paper strip inside lock itself	531
235	Recording door lock records on sensitized paper dial by key	532
236	Clock-dial design recording door lock	533
237	Door lock recording with stylus on rotating chart ..	534
238	Watchman's equipment, master-clock control and printed record	537
239	Watchman's time system	538
240	Portable watchclock with paper dial	539
241	Making a connection on private switchboard	543
242	Differing dials shown in two automatic exchange telephones	544
243	Showing use of one type of automatic telephone system	545
244	Multiple-wire desk and wall types of "secret-service" telephones	546
245	Interior telephone system	547
246	Loud-speaking telephone system	548
247	Showing use of voice silencers on office telephones ..	549
248	Voice silencers, scientifically built telephone mouth-pieces	550
249	Adjustable length, collapsible extension telephone bracket	553
250	Telephone-holder attachment	554
251	Receiver holder for telephone	558
252	Electric paging system operated in connection with switchboard	559
253	The telephone typewriter in operation	561
254	Using the credit authorization telephone system	565
255	Stamping credit "O.K." on sales check by button pressure	566
256	Showing the telautograph system in use	572
257	Wire-line carrier conveying system in office	573
258	Use of wire-line system in retail store	574
259	Operation of cable carrier	576
260	Central desk of an automatic cable system	577
261	Sending papers through pneumatic tube system	578
262	Centralized pneumatic tube system for incoming and outgoing mail	580
263	Belt conveyer device for carrying correspondence, and so forth	581
264	Automatic "ad"-stamper attached to roll of wrapping paper	584

265	Filling and removing waste-paper from baling press	585
266	Calculation stamps and imprints	587
267	The calculating slide-rule	588
268	Motor-driven ticket-counting machine	589
269	Two views of the coupon-printing machine	591
270	Hand-operated envelope moistener	592
271	Automatic eyelet fastener	593
272	Three units of the floor-scrubbing system	594
273	Folding machine	598
274	Multiple stamp with index showing ten plates	600
275	Hand numbering machines	602
276	Desk paper cutter with attached knife	604
277	Hand wheel-operated bench cutter for heavy paper	605
278	Motor-driven paper cutter constructed for extra heavy stock	606
279	Adjustable multiple hand paper punches in two styles	607
280	Motor-driven perforating machine for various uses	609
281	Receipting-coupon cutter	610
282	Electric-operated ticket-marking machine	612
283	Fire-proof safes adequate record protection in disaster	617
284	Scientific tests to which fire-proof safes are submitted	618
285	Construction of safes	619
286	Locking device on interior safe door for burglar protection	621
287	Two means of efficiently equipping safe interiors	628
288	Circular style of vault doors	629
289	Steel filing cabinets in vault, and doors of modern insulated type	630
290	Steel storage and supply cabinets	631
291	Protection afforded by safety-deposit boxes within vaults	634
292	Safety chests for greatest possible strength and protection	636
293	File drawer showing alphabetically indexed guides	641
294	One form of correspondence file with four elements indicated	643
295	Numerical file with cross-reference cards and divisional guides	644
296	Geographical files with state, city, and auxiliary guides and folders	645
297	Alphabetical arrangement of a subject file	647
298	Follow-up system of filing, correspondence size	650
299	The card-index follow-up file	653
300	Numerical and alphabetic card ledger files	655

301	The sales-record card	657
302	Typical stock-record card	660
303	Credit file and the credit-record card	663
304	Floor plan of central filing department	666
305	View of a typical filing department	669
306	Wood and steel filing cabinets, unit construction	673
307	Vertical units in different styles for filing	674
308	Complete battery of filing unit series	675
309	Two styles of upright filing cabinets	677
310	Counter-height unit-type of file equipment	678
311	Horizontal file cabinets and half-unit	679
312	Vault-truck filing equipment combining any desired units	680
313	Card cabinets and card-file desk trays	681
314	Filing desk cabinets constructed with safe character- istics	683
315	Card-record desks in two styles	684
316	Single-unit card-record desk	685
317	Standing steel card-ledger desks	686
318	Card-ledger trays facilitate machine bookkeeping ..	686
319	Steel transfer filing case for infrequent reference	687
320	Steel storage shelving built on unit principle	688
321	Arch and board file for temporary records	689
322	Card file guides with tabs in halves, thirds, fourths, fifths	690
323	Guide tabs-cut, celluloid, and metal protected	691
324	How index label is inserted in frame of celluloid tab guide	692
325	Different kinds of correspondence folders	693
326	Various ruled and blank standard form cards for every business	694
327	A group of visible indexes of the cabinet type	697
328	Metal-hinged holder of visible index system	698
329	Visible index of wire holder type	699
330	Overlapping pocket type visible index unit	701
331	Card-carrier index visibility maintained by rigid bars	702
332	Die-cut index cards with regulated line visibility	703
333	Use of slotted guide card in file cabinet	705
334	Visibility in index by overlapping cut cards	706
335	Visibility, compactness, accessibility, and low cost in filing	707
336	Rotating, upright index a convenient and compact method	708

337	Straight-track upright index file of panels on parallel tracks	709
338	Panel book units, horizontal to vertical swing, indexed and removable	712
339	Two styles of ring-bound, overlapping record sheet book-unit indexes	714
340	Two-way book-unit cabinet, can be used at same time by two persons	716
341	Numerical card selector	720
342	Class-name card filing and finding device	723
343	Group segregator system of card filing and finding ..	725
344	Perforated and slotted card of group segregator filing and finding system	726
345	Group segregator system of filing and finding in operation	727
346	Showing comfort and beauty combined in office furniture	730
347	Roll-top desk	732
348	Flat-top desks	734
349	Center drop and side compartment typewriter desks ..	735
350	Center drop typewriter desk with time-saving features ..	736
351	Revolving office chairs	739
352	Office chairs with adjustable height and back-rest ..	740
353	Office tables	741
354	Sectional and one-piece bookcases for office use	744
355	Office lockers	746
356	Desk trays	749
357	Desk lamps	751
358	Solid-post binders, threaded and smooth type	755
359	Sectional-post binders, top-lock and end-lock styles ..	756
360	Sectional-post binders for storage purposes	758
361	Sectional-post binder with automatic expansion	759
362	Hinged-post binders	760
363	Chain-post binders	762
364	Expansion-tube binders	764
365	Fabric-thong binders	766
366	Combination thong- and post-type binders	768
367	W-shaped binder rack for aid in mechanical posting ..	770
368	Loose-leaf binder and binder rack	775
369	Steel-strap style of binder	777
370	Telescoping-back loose-leaf ledgers	780
371	Round-back fixed-capacity binder	784
372	Ring-binder, showing fastening device	787
373	Catalog and folding price-book binders	790

374	Numerical, alphabetical, and geographical indexing ..	795
375	Billing machine cut forms	804
376	Billing machine attachment with roll style continuous length paper	805
377	Billing machine with continuous roll form	806
378	Fan-fold type of continuous form	807
379	Inter- or auto-fold type of continuous forms	808

I

THE PURPOSE OF THIS BOOK

Three primary aims. Office procedure and efficiency emphasized. How to find specific information.

THE purpose of this book may be said to be threefold: first, to provide, for academic use—in universities, commercial colleges, and even in secondary schools—an authoritative text-book on all office appliances; second, to give an uncolored description of each office machine, device, and system, to the end of furnishing interested business men with unprejudiced information on these appliances, as an aid in planning the betterment of their office work and in buying; and third, to provide the large number of executives, salesmen, and other workers in the office appliance industry with a truly representative handbook on the industry itself.

Looking at it from the first view-point—as a text-book for student instruction—it becomes immediately apparent that this book, giving as it does, for the first time, a complete discussion of the entire office appliance industry, will find a wide use. Beginning with an unbiased history of the industry as a whole, as well as the history of the development of specific machines, and continuing through the description, operation, and application of kinds and types of machines, devices, and systems, it is hoped that this manual will fulfil the need, which has so long existed, for some such text-book on office appliances.

From the second view-point—that of the business man—the information to be found in the following pages is of still greater importance. In the first place, the primary aim has been to point out the actual cash savings which can be

realized from the proper use of office appliances, equipment, and systems. In short, the results angle, as well as the "how" and "why" angles, has been emphasized. Further, the business man will find this book most valuable as a guide in the intelligent buying of the office tools to suit his particular needs.

Finally, because of both the very intensity of the remarkable development of the office appliance industry during recent years and the character of the information furnished by the manufacturers for inclusion in it, this volume becomes of incalculable value to office appliance manufacturers, as an instructive manual for both the executives and the salesmen within the several companies, and for the dealers in those specialties.

OFFICE PROCEDURE AND EFFICIENCY EMPHASIZED

While the three aims just outlined have been accorded the initial emphasis, there are several secondary purposes which have not been overlooked. In addition to the primary and moving purposes responsible for this volume, the subject has been so handled that the reader will find herein a complete manual of office efficiency and procedure. Not only have the many varied office tools been described, and their application made clear, but also, there is given what may be likened to a cover-all manual for the economical operation of the office.

For instance, the bookkeeper or accountant will find in the following pages a complete coverage of the problems of this phase of every business in so far as the machine and system angles go. From another, and entirely different, angle, the problems of the stenographic department are similarly covered. Then, too, the chapter on "The Application and Value of the Systematization Idea in Business" will prove of large interest to the executive concerned not with any single department or function of the business, but rather with

the larger problems of the entire business. Likewise the section in which the activities of all businesses are functionally classified should find a wide and varied use.

In order to assist the reader, a complete cross-index has been provided for the finding of the more ordinary classifications, subjects, and so forth.

The interested reader will do well to read Chapter III, "Classification of Office Machines and Systems," before starting in on the chapters covering specific machines.

II

HISTORICAL BACKGROUND OF OFFICE MACHINES, EQUIPMENT, AND SYSTEMS

The Industrial Revolution. One of the first labor-saving devices. Early achievements in office machinery.

BEFORE approaching the history of office machines, it may be well to survey the changing conditions which demanded imperatively the various devices which speed up work in the modern office. To start at the beginning, we must go as far back as 1780, the date of the tangible appearance of that movement, the Industrial Revolution, which so recast our whole world of thought, actions, and institutions. Of the power and scope of the Revolution one writer says:¹

The movement has done far more than shower upon us a series of inventions, or bless mankind with a new technique. Appearing gradually, and working indirectly as well as directly, it has affected our whole world of thought, of actions, and of institutions; it has modified our economics, our politics, our ethics, and even our religion; it has changed in nature, number, and form our baffling problems; it has written itself large in our culture.

It is not our intention, nor is it necessary, to delve further into the aspects of the Industrial Revolution than to briefly recall some of the facts which explain the necessity of new methods. Right at this time, there appeared a new attitude toward life and its problems. Brash adventurers, roving uncharted seas, had discovered new lands. Others, as bold, had followed the lure of treasure and founded new colonies. Colonial ventures led to the extension of the market and increase in the size of the industrial unit, which in turn called for a reorganization of the factory and the division

¹Marshall: *Readings in Industrial History*.

of labor. Thus was created a minute specialization which served both as an incentive for the invention of new machines, and furnished an opportunity for their use.

Prior to the Industrial Revolution, most things were hand made. The worker owned his tools, but often he did not own the material on which he worked. Thus, certain features of the factory system were evidenced years before the use of power machinery. In some cases, workmen were employed in large numbers in buildings owned by the employer, who also furnished the mechanical equipment. Manufacturing was, however, combined to a large extent with agriculture.

Numerous mechanical inventions during the last half of the eighteenth century swept away inefficient methods.

Better roads, canals, and finally the steam locomotive answered the demand for better transportation made by increased production. And because new machinery and methods were applied to transportation and communication, markets increased.

The railroad made modern business possible—just as much by its transportation of information as by its movement of goods.

ONE OF THE FIRST LABOR-SAVING DEVICES

The last five decades have, beyond a doubt, meant more to the world's progress than any previous five centuries. The introduction of machinery has minimized manual labor; it has raised the standard of living and substituted brains for brawn in the commercial activities of our time. The results obtained from the use of machines have broken down the prejudice that met their substitution for human effort. Even that most formidable objection—that their introduction would bring about unemployment—has long since been exploded.

It is not so long ago that a business letter was a great event. The head of the firm dictated his communication to a shorthand writer, who wrote the letter painstakingly with

pen and ink. Once inscribed, the letter was dependent upon messengers or the slow, tedious mail-coach, or the faster, yet more hazardous, pony express rider.

Like inventions in other lines, the first machine for accomplishing office tasks came, not in response to a demand on the part of many, but in recognition of a need by a few.

Thus it was that the first of the ever-growing office appliance family, the typewriter, came into being. It would seem that printing, the most important single advance in the history of civilization, should have suggested the idea of a writing machine. But more than 400 years elapsed after Gutenberg's invention before the typewriter appeared. As far back as 1714, however, men had the idea of a mechanical substitute for the pen.

In the records of the British Patent Office we find that a patent was granted by Her Majesty, Queen Anne, to Henry Mills, and English engineer, in 1714. There was no model or drawing of this machine, but Mills had the idea.

The names of those imbued with the desire to produce a successful writing machine would make too long a list even to be mentioned here; so we shall tell only of the three men—Christopher Latham Scholes, Samuel W. Soulé, and Carlos Glidden—who brought the first typewriting machine to successful completion. Both Soulé and Scholes were printers; Glidden was engaged in the development of a mechanical spader to take the place of the plow. Years before, Scholes had been the first to address newspapers by printing the subscribers' names on the margins. At the time of the beginning of the typewriter story he was working on a machine for paging blank books.

Glidden one day asked why it wouldn't be possible to build a machine which would print letters and not figures only as did the paging machine. The answer to this question was an attempt by Glidden, Scholes, and Soulé to construct a device which would supplant slow methods of writing. None of these three men had heard of any previous attempt to build such a machine.

All of them were inventive but not mechanical, so they enlisted the services of Matthias Schwalbach. It was a great day when the first machine was at last completed (1867). Although it was a crude affair, the machine did write accurately and rapidly. Among the first letters written with the wonderful machine was one to James Densmore, who immediately became interested and shortly afterward purchased an interest in it. Soon afterward, Soulé dropped out of the enterprise.

Finally, in the year 1872, the inventors had a machine which pleased them. The fundamental principles of construction survive, though their application has since been modified or transformed in the march of improvement.¹

EARLY ACHIEVEMENTS IN OFFICE MACHINERY

After the typewriter came a stream of mechanical contrivances for short-cutting. Some were produced for the purpose of improving the quality of hand-work, others to increase unit speed over hand methods, and still others to improve both the quality and quantity.

Among the latter type will be found the most successful and practical inventions calculated to produce mass results of a better quality than could possibly be produced by the best of craftsmen.

About the time that Scholes was laboring with the typewriter, James C. Wilson was experimenting with a time-stamp which was patented in 1871. This device was the ancestor of the electrically driven and the clock-driven time-stamps and time-recorders of all sorts which now keep track of time in the office.

The autographic register made its appearance in 1875, inspired by the recognition on the part of a lawyer, James C. Shoup, of the need for a mechanical means of record-keeping.

In Chapter XXV the story of the invention of the first

¹The complete story of the typewriter is given in Chapter XXI.

addressing machine, which was one of the first aids to business, is told. About the same time the first duplicating machine was evolved, although copies had been reproduced before then by what was known as the Hectograph process.

The invention of one tool demanded or demonstrated the possibility of another device for further lightening of work. Often one machine served as a basis for another. For instance, Chapter VIII tells how the adding machine, with slight modifications, became a bookkeeping machine, and how adding units were attached to a typewriter so that it, too, could do bookkeeping work.

In each chapter a history of the device under consideration is given; that is why only a few of the older office contrivances have been mentioned but briefly, in passing, just by a way of illustrating the growth of the industry. For every phase of office work which involves repetitive effort, or which is the source of delays or inaccuracies, or which abounds in lost motions, there is today some device, or some type of equipment, designed to reduce the amount of labor, to increase the accuracy of the work, and to produce the desired results in a more efficient manner. Each year brings forth its quota of new office appliances for the study and consideration of the office manager. There is not a doubt that, in the next 10 years, machines will perform much of the work in offices that today is mental drudgery.

III

CLASSIFICATION OF OFFICE MACHINES AND SYSTEMS

Diversity of office machines. How a functional classification aids the reader. Why machines are classified as to functions.

THE hand punch on your desk is an office machine. So is the amazing device which automatically selects cards by cross-classification and presents them in groups without disturbing the filing order. Thus you see what a comprehensive subject we are tackling.

The very number and diversity of the devices for facilitating every office motion makes the collecting of information about them a staggering task. Very little has been written on the subject, and even statistical information from which to make a complete tabulation is lacking. It is, therefore, possible that, notwithstanding the very exhaustive research which was necessary for the writing of this book, a few appliances on the market may have been missed.

Not until late years has the average business man been concerned with bringing modern methods to his office. But, now that the value of mechanical substitutes for human effort has been demonstrated to him, he is constantly on the lookout for devices which will save time and money, and secure accuracy.

Determining the proper machines to fit his needs is not the smallest problem the office executive has to solve. He knows there are machines which will do away with a great deal of the mental drudgery that the day's work demands, but he may not be wholly familiar with their workings and applications. Only after a thorough investigation and actual test of the various appliances will he be able to decide upon the

machine which will do his work most efficiently and economically.

Before he starts substituting mechanical methods for laborious human methods, he must first know about all the different types of machines available. He must have a general idea of each kind of machine and its functions. Then, only, can he select the machine particularly adapted to his kind of work.

It is to aid the executive in his search for methods to make every moment count, that this book has been written. From it he may learn of appliances and methods of which he was ignorant, of applications of which he knew nothing.

HOW A FUNCTIONAL CLASSIFICATION AIDS THE READER

Further to aid him in putting his hands on the precise information he is after, office machines, devices, and systems are classified in this chapter. Of course, by dividing the book into chapters a classification is made, but because the average reader is not aware of the many applications which the individual machines may have, it was thought well to classify them further as to function. The following illustrations will bring out this point more clearly:

Perhaps it surprises the average reader to find addressing machines listed under Accounting. As far as he knows, an addressing machine is a device which can speedily print names and addresses on envelopes. He does not happen to think that with the same machine he can head up ledger pages and statements, thus reducing bookkeepers' labor and eliminating errors. Immediately, he becomes interested to find out in what other ways he can use a machine of that sort. He may already have an addressing machine which has been standing idle part of the time, because he did not realize its versatility.

Again, if a man finds there are inefficiencies in the performance of a certain kind of work in his office, he can turn to the division in which that function is listed and find the

machine and systems which he may apply to that work.

For instance, an executive finds that there are delays in getting out the mail. Promptly he turns to our third division, Correspondence. He finds that it is subdivided into three parts: one, headed Incoming Mail; a second, Answering Mail; and a third, Outgoing Mail. Under each he finds those machines which have anything to do with these three operations.

Now let us turn to the classification itself, which follows. It will be noted that some machines appear under more than one heading. The reason is, of course, that such machines aid in more than one kind of work.

I. ACCOUNTING

A. Bookkeeping

- Addressing Machines
- Autographic Registers
- Bookkeeping Machines
- Ledger-Posting Desks
- Loose-Leaf Devices
- Posting-Machine Desks
- Time-Recording Devices
- Typewriters

B. Billing

- Addressing Machines
- Autographic and Manifolded Registers
- Billing Machines
- Calculating Machines
- Copy-Holders
- Duplicating Machines
- Forms—Cut and Loose-Leaf
- Slide-Rules
- Typewriters

C. Money Handling

- Cash Registers
- Check Certifiers
- Check Endorsers
- Check Protectors and Writers
- Coin-Changing Devices
- Coin-Counting Machines
- Coin-Wrapping Machines

Perforating Machines
Signature Devices

D. Statistics

Adding Machines
Calculating Machines
Loose-Leaf Devices
Slide-Rules
Tabulating Machines
Typewriters

II. RECORDING CASH AND CREDIT TRANSACTIONS

Adding Machines
Adding Machine-Cash Registers
Autographic Cash Registers
Autograph Registers
Cash Registers
Credit Registers
Loose-Leaf Devices

III. CORRESPONDENCE

A. Incoming Mail

Letter Openers
Time-Stamps

B. Answering Mail

Copy-Holders
Dictating Machines
Typewriters

C. Outgoing Mail

Addressing Machines
Envelope Sealers
Permit Machines—Metering and Non-Metering
Precanceled Stamp Machines
Scales
Stamp Affixers

IV. CIRCULARIZING

Addressing Machines
Duplicating Machines
Envelope Feeders
Folding Machines
Permit Machines
Precanceled Stamp Machines
Scales

Sealing Machines
Stamp Affixers

V. SHIPPING

Addressing Machines
Autographic Registers
Label-Pasting Machines
Package-Tying Machines
Parcel-Post Machines
Sealing Machines
Stamp Affixers
Stencil-Cutting Machines
Tape Sealing Machines
Wax Sealing Machines

VI. INTERCOMMUNICATION

Cable Systems
Duplicating Machines
Electric Charge Authorization System
Electric Paging Systems
Handwriting Transmitting Machines
Pneumatic Tubes
Telegraph Typewriters
Telephone Credit Systems
Typewriters
Wire Carriers

VII. FILING OPERATIONS

Filing Equipment
Filing Supplies
Finding and Filing Systems
Visible Index Systems

VIII. GENERAL UTILITY DEVICES

Dating Stamps
Finding and Filing Devices
Furniture
Intercommunicating Systems
Paper Cutters
Paper Punches
Perforating Machines
Synchronized Time Systems
Telephones
Typewriters
Visible Indexes

WHY MACHINES ARE CLASSIFIED AS TO FUNCTIONS

In the classification just given, an attempt has been made to group all machines so that their potentialities may be the more readily grasped by the casual reader. No effort has been made to suggest all the possible uses of any type of machine; that will be done in the chapter given to each machine.

Now to answer the reader's question, "Why has such and such a machine been placed under this heading?" That all such points may become clear to the reader, let us start at the beginning and work straight through the classification, elaborating a bit on the part each machine plays in the various divisions of office work.

You see that under the general head of Accounting there are four subheadings: Bookkeeping, Billing, Money Handling, and Statistics.

To lighten bookkeeping tasks there are adding and bookkeeping machines—their place in the office is evident and undisputed. From the office copy of a transaction, made on an autographic register, perhaps, the bookkeeper posts the ledger page of the proper customer on the bookkeeping machine; this posting consists of date, description, folio number, and amount of sale for each transaction. Although not actually used in the accounting department, the autographic register speeds up accounting and is, therefore, mentioned in this division.

Autographic registers have been included under the heading of Billing, because these machines are used extensively for making out bills of lading. Billing machines, of course, come under this heading.

In the next group, Money Handling, come those devices which sort and count coins, and those which change coins. In getting out checks, check protectors and writers serve a great need in this division of office work, as do signature devices. Check certifiers and endorsers and perforating machines also serve a purpose.

The next heading, Statistics, needs no explanation. Adding machines accumulate the figures from which statistics are compiled. Calculating machines also help in this work. Then in order to get the figures into workable and meaningful form the tabulating machines are called upon, and finally the loose-leaf device for holding the record.

The second general heading is, Recording Cash and Credit Transactions. The functions of each of the six machines listed under this heading are obvious.

Every office is concerned with getting its mail out promptly; therefore, the third main division has to do with the receipt and dispatch of mail. Getting mail out promptly depends on three things: First, upon its prompt handling as soon as it arrives, then on the actual answering of the letters, and last, upon getting them ready quickly for the mail box. Letter openers get mail opened quickly; time-stamps record the time of delivery and encourage prompt attention from the recipient.

Dictating machines insure efficiency and speed in getting letters answered. And, of course, correspondence would have to be curtailed considerably were it not for the typewriter.

Nothing need be said about the part played by addressing machines. Scales are determining the amount of postage to be put on mailing matter. Stamp affixers and machines which seal and stamp or seal and print the permit indicia make quick work of great stacks of outgoing mail.

In offices where any amount of circularizing is done, the machines listed under the fourth heading, Circularizing, have proved their worth. Processed letters, folders, and other direct-mail advertising matter are made on duplicating machines. Folding machines come in for their share of the process, as do typewriters, scales, sealing machines, stamp affixers, permit and precanceled stamp mailing machines.

The work of the shipping department could not go on without those devices listed under the fifth heading.

Intercommunication, especially in a large office, is an item not to be ignored. Typewriters and duplicating machines produce written communications. For other communications there are numerous devices. Most common, of course, is the house telephone. Some of the more unusual are pneumatic tubes, electric paging systems, electric charge authorization systems, telegraph typewriters, and telephone credit systems.

Filing presents a problem in every office. Therefore, the seventh heading is Filing Operations. Considered under this are filing methods and filing supplies and equipment. Here also belong visible index systems, and the devices which find and file cards.

The last heading includes all general utility devices which make office operations more efficient. Here would come such equipment as dating stamps, telephones, typewriters, paper cutters, and so forth. Time clocks play a rôle here by emphasizing the importance of time, thus establishing habits of regularity among employees.

Now that this classification has been made, the reader may turn to those chapters given to the particular machines which perform the tasks in question. There he will find out more about the machines and their ability to do certain work.

IV

THE APPLICATION AND VALUE OF THE SYSTEMATIZATION IDEA IN BUSINESS

How the office appliance industry started. What is *systematization*? The seven elements of system. Application of systems, machines, and equipment in banks. (1) Handling deposit items: commercial deposits; savings deposits; bank deposits; systems that speed up work; machines and equipment increase efficiency. (2) Loan and discount activities: notes discounted; collateral loans; mortgage loans; bonds; systems; machines and equipment. (3) Meeting the problems of exchange: teller records; collections; transit items; keeping records of exchange; machines and equipment. (4) Trust department activities: corporate trust activities; individual trust activities; systems; machines and equipment. (5) Safe deposit: systems; machines and equipment. (6) General and administrative: systems; machines and equipment. Commercial institutions. Four functions of office routine: (1) Buying: placing the order; receiving and inspecting goods; recording value, quantity and cost; paying. (2) Selling: order-writing; shipping; billing; accounting. (3) Administration. (4) Production. Public service corporations. Gas, electric, and water companies: order-writing; billing; systems and machines. Railroad, steamship, and express companies: passenger service; freight service. Telephone and telegraph companies. Hotels and Clubs. Institutions. Professions. Miscellaneous: brokers; insurance; municipal, county, state, and federal offices.

THE exchange of thought among business men has been the most wonderful influence in business during the past 25 years. From this exchange of view-points there has resulted, among many other invaluable benefits, a complete revolution in office methods—the substitution of machines for hand-work, and, to a large extent, for brain-work.

The sheer necessity of keeping office work abreast of the extraordinary expansion of business during the last quarter-century, of course, was the dynamic force behind the quest for simplified, improved methods of carrying on office routine and solving office problems, but it was the exchange of ideas among business men that brought about similarity of methods and made possible the mechanical handling of office work.

When business method was individual and self-centered, and business aims narrow and secretive, there was little incentive for inventive genius to burn the midnight oil in the search for business machinery. The demand for mechanical office appliances did not exist because there was no similarity of method. But as similarity of method spread, through the exchange of ideas, the possibilities for mass production attracted some of the keenest minds in the country, who turned to making machines and devices that would simplify the mass of problems crowded into the business man's day. As a result, an immense industry has been created—an industry which produces office machines and devices for the entire world.

An eminently successful business man stated in an article published a short while ago, that back in the eighteen hundreds every man in business was a grubbing slave. This man himself, as a fifteen-year-old apprentice, worked from five in the morning until seven at night. Sunup to sundown was a typical business day. Yet the office work, like a housewife's toil, was never done.

But no old-timer, thinking back to the cumbersome business equipment in use in those old days, wonders at the long hours and slow, tortuous business progress.

Correspondence was filed flat in cardboard cases which frequently covered all the walls to the ceiling of a business establishment. The hunt for a letter was often an all-day ordeal rather than a routine incident. Record-keeping was done by hand in ponderous bound volumes. Trial balances appeared at historic intervals, and departmental digests and comparison reports were almost unheard of.

The average executive preferred to keep most of his facts in his head rather than burrow through the hand-made office encyclopedias to dig out his information.

If the proprietor of a large enterprise wanted to get a line on a given department, he usually went into that department in person and stayed there until he had made a check-up.

Personal contact was his chief means of intercourse both with his employees and his customers.

Contrast this with the smooth-running, high-speed, automatic machinery of facilitation which is used in up-to-date business today. This morning, literally thousands of executives looked at compact typewritten reports which gave them a graphic picture of their business operations. Tomorrow these executives will go over other reports—reports recording and spotlighting every change that has taken place in these operations during the preceding 24 hours.

Their appraising, recording, and bookkeeping are largely machine processes. Even their cash is counted and guarded by automatic mechanism. Duplicating, printing, and addressing machines place them almost within speaking distance of their salesmen in the field, their dealers in the store, and their consumers in the home. And so on, through the dozens of business appliances that have helped to make the present eight-hour business day a thousand hours long in its potentials of accomplishment as measured against the business day of 25 years ago.

But business has expanded so rapidly during the past few decades that it has been quite impossible for the average business man to keep up with the myriad improvements for facilitating its numerous activities. One has only to go out and investigate methods in half a dozen businesses to find numerous instances where improved systems and machines could be properly installed.

It is this condition which has pointed to the need of such data as supplied in the following pages, which provide a real, tangible, specific background for the correlation and coordination of all office activities on an economical and speeded-up basis.

With this thought in mind, the application of the system angle to all business transactions as well as the relation of the system idea to the many machines and devices taken up later on, will be explained here. Since the object of taking up this phase of the problem at all is merely for

the sake of providing the reader with an as-brief-as-possible summary of the practical possibilities, the outline form should suffice. Further sources of more complete information will be indicated in footnotes.

The several divisions of business will be taken up and covered according to the classification given in the preceding chapter. But first let us decide what systematization is.

WHAT IS SYSTEMATIZATION?¹

As a general definition, we might say that *systematization in business* is nothing more than a plan or method whereby the several essential parts of a transaction are brought together into an interrelated whole; a mode of operation governed by general laws and rules and conducive to orderliness.

What, then, do the several office appliance manufacturers mean when they claim to originate and sell system? They have in mind that system is the means by which maximum results in any endeavor may be obtained with the least expenditure of resources, exertion, or time.

So, system, considered in this light, simply means "the Direct Method." In other words, system means the elimination of lost motion in the greatest possible degree. And naturally, system must have as its object a better result, too, than can be arrived at without system.

To go on, the manufacturers of office appliances propose through system to eliminate guesswork from business programs and provide methods by which certain standards of performance may be set up and realized; it tells executives WHAT facts they should know about their business, WHY they should know them, and HOW to get and understand these facts and use them in controlling their business after they are provided.

System may provide a better method for keeping one of many records in an office without changing any other rec-

¹The editors are indebted to the Baker-Vawter Company, Benton Harbor, Michigan, for the material which follows.

ord. But its effect on, and relation to, the other parts and activities of the business must be considered. It must function independently and still be interrelated to the whole business machinery.

A modern billing system may suggest manifold invoices and typewriting machinery. It probably will include the use of calculating machines.

Modern bookkeeping suggests cards and trays, loose-leaf ledgers and containers, and bookkeeping machines.

Statistical records suggest various loose-leaf forms and binders; but their operation, speed of compilation, and accuracy of result may depend on calculating machines or tabulating machines.

Viewing system from this angle and all angles, we begin to realize how big the subject is. There are all kinds of systems. There are banking systems, commercial systems, factory systems, transportation systems, cost systems, accounting systems, and many others. Yet each kind has some definite results as its object and provides the best way of arriving at them.

Now, while *systematization in business* and *service in selling* are indeed very closely related the one to the other, a clear differentiation between the two in the mind of the reader is essential before any definite appreciation of the problem under discussion can be arrived at. True, most every business sells service, but before that service can be efficiently rendered, the importance of system in the business itself must be fully appreciated and realized. With this distinction definitely in mind, we are always ready to analyze system and find out just what it is.

THE SEVEN ELEMENTS OF SYSTEM

Your present understanding of system may center upon a simple form. Or you may go a little further, and visualize system as being a set of forms for the accounting department. But when you come right down to it, system is more

than a form or a set of forms. It is more than a machine or battery of machines. In short, in devising a system, the following factors must be taken into consideration: (1) organization; (2) personnel; (3) premises; (4) records; (5) forms; (6) methods; and (7) routine.

Now, let us go a little deeper into the subject and find out of what each one of these seven elements consists.

Organization. The nature of the business organization, its size, the scope of its operations, its desire for detailed information of its affairs, its understanding of the value of such information, its determination to secure it and its capability to use and appreciate it after it has been compiled must be given first consideration in any plan for a system.

Personnel. The success of system depends as much on the people who must maintain it as upon its own merits. They must have the intelligence to understand it, the capacity to operate it, and the desire to make it a success. The best system ever devised will be a success only to the extent that these factors are present in the personnel.

Premises. The layout of the business home is also important. Its arrangement, its convenience, whether operations are centralized in one building or carried on in different buildings located in one city or in several, will determine many factors of the system.

Records. The records in a system are its several parts; each one tells a story and pictures the result of a separate activity of the business, yet each one bears a definite relation to the other records of the system.

Thus, a complete system might embrace purchase records, receiving and disbursing records, stock records, sales records and analysis, accounts receivable, accounts payable, receipts and disbursements of cash, filing and indexing of correspondence and orders, production records, shipping records, and records of expenses, profits, and so forth.

Forms. Forms are leaves, cards, and sheets on which and

from which the records are compiled. Thus a record may consist of several forms and the data of one form may be recorded in several records.

An order blank is a form. The salesman writes his order on it and mails it to the office. Here it is interpreted and the credit approved; it may be registered in a numerical record and given a number. The order itself or a copy of it becomes the manufacturing or shipping order or both; from it manufacturing or shipping records are compiled; it forms the basis of the invoice and charge to the customer and is recorded often before it finally is filed away in its proper place designated by the system. Its proper filing for future reference is a good example of system.

Methods. The methods of obtaining proper results from a system embrace proper indexing, filing, entries, and the mental and physical operation of its operators. They are the *how to do it* of the system. They are the plans of action. So, methods rightly include the machinery and other physical properties employed in the operation of the system.

Routine. Routine is the course or route followed by the various forms of a system through an organization during their compilation and entry in the various records they affect. Routine is best illustrated by charts which show the desk and departments through which each form passes from its inception to its final place of reference.

The routine chart is the map of the system. Industrial engineers have used it for years in outlining procedure and operations in factories. It is only recently that its application to office work has been recognized and adopted.

To visualize for the reader the possibilities of a proper utilization of the *system idea*, it seems advisable to divide all business for the purpose of convenient treatment. Viewed from this angle, the following classification results:

1. Banks and Financial Institutions
2. Commercial Institutions
 - a. Manufacturers

- b.* Wholesalers
 - c.* Retailers
- 3. Public Service Corporations
- 4. Hotels and Clubs
- 5. Institutions
- 6. Professional
- 7. Miscellaneous

In the following pages a composite average business in each classification will be taken up, its activities subdivided functionally, and the application of the *systematization idea* to each functional operation outlined. As well, the specific forms, machines, and other equipment essential to the economical and profitable operation of the several systems, will be listed. And while this valuable information will of necessity have to be very abbreviated, due to the limited space which can be devoted to it in this volume, the data presented are sufficiently complete to provide a real background for the further study and investigation of the *systematization idea* by the interested reader.

APPLICATION OF SYSTEMS, MACHINES, AND EQUIPMENT IN BANKS

One of the fundamental needs of banking is a system for the maintenance of proper records of all transactions. And as the evolution of banking means changes in conditions and requirements—revisions, adjustments, or replacement of methods already in use—in no other business is there a greater opportunity to economize and save time by the application of mechanical devices.

The development of machine posting¹ was accomplished much earlier in the banking field than in the commercial field. Because of the nature of their work, banks were prepared to take advantage of the improved systems without affecting the routine work of the institution. In the com-

¹Refer to Chapter VIII, Bookkeeping Machines, for additional information.

mercial bookkeeping department, all items to be posted to the accounts were already reduced to units—that is, each deposit slip and each check was an item to be posted to one account and contained one posting item only.

Without the development of the loose-leaf system, however, the modern machine method of posting commercial depositors' ledger items would be impossible, for several obvious reasons. Moreover, as only active accounts may be carried in the loose-leaf ledger, this reduces its size considerably and makes it more portable and usable, thus promoting speed and accuracy in handling such an extremely active installation.

One method of proving the daily work on the commercial ledger used today is the dual system of proof, which involves the posting of all the items first to the ledger binder and then to the corresponding statement binder. These binders contain the same accounts and in the same order, the statement being prepared for release at the end of the month with the canceled checks. At the end of the day's posting, it is only necessary to "call back" or compare the balances—which are extended daily—one with the other, to know that correct items have been posted to the right accounts to both statement and ledger.

A trial balance of the commercial depositors' ledger must be taken frequently. In an extremely large installation, a trial balance is taken every day. In smaller installations it is taken usually three times a week, and never less than once in ten days in any installation which is at all efficient. A trial balance of the depositors' ledger consists of listing all of the open items on the ledger and proving them against the control account for the department.

The loose-leaf binder¹ facilitates the use of machines in taking trial balances, with the consequent advantages of greater accuracy and speed. The daily extension of balances also assists in taking off a more effective proof of post-

¹Refer to Chapter XXXVIII, Loose-Leaf Accounting Records, Equipment, and Systems, for further information.

ing. Even where the Boston Ledger system is used, adding machines must be employed for taking off so-called "batch totals," that is, the total of all checks against any one account for posting. The machine makes for greater legibility and becomes an economy in that both statement and ledger may be posted on the machine.

It is readily apparent that both in the machine and loose-leaf field, the system method of handling the necessary routine transactions and records is of great importance. In the following pages the various activities of the bank are first functionally classified, and the place of various machines, devices, and systems which facilitate the various operations fully covered.

In the classification of bank activities, there are six general divisions of work which must be considered in their relation to the best methods for facilitation. These are:

1. Handling deposit items
2. Loan and discount activities
3. Meeting the problems of exchange
4. Trust department operations
5. Safe deposit—safe-keeping necessities
6. General and administrative functions

I. HANDLING DEPOSIT ITEMS

This branch of a bank's activities is again divided into three major subdivisions: commercial deposits; savings deposits; bank deposits.

Commercial Deposits. As most of the banks of the country are commercial institutions, they accept demand deposits of individuals. All items deposited are sorted as they are received, and listed; customers' checks are posted on the depositors' ledger and statements are listed on the check and deposit journal. After the bookkeepers and statement clerks have established their daily proof, the checks are sent to the canceled check files for distribution. Checks on

other banks, both local and out-of-town, must be sorted and listed on an adding machine. A clerk lists the items on a clearing-house sheet, remittance letter, or collection letter, copies of which are retained by the bank; originals are sent with the checks to the clearing-house, to correspondent banks, or to banks on which they are drawn.

Savings Deposits. Savings deposits are handled in the same way except that there are no statements to post, as savings accounts, generally speaking, are not subject to check. A ledger record is kept of deposits and withdrawals.

Bank Deposits. A bank deposits funds in other banks and draws checks on them just as the individual deposits in a bank and withdraws from it. The bank does not always collect all outside items through its correspondent banks. Bank checks, bills of lading, and drafts are sometimes sent direct to the bank on which they are drawn. These accounts are usually charged into a "Transit" account until remittance in payment of the items is returned. The bulk of items going out to depository banks is charged in total to the correspondents on the day sent.

Systems That Speed Up Work. Thousands of banks are now using forms and methods which relieve much of the detail in handling deposits; for instance, loose-leaf or card ledgers for both commercial and savings accounts; card and visible indexing systems for signature cards; and filing systems for all records. Among the record-keeping forms used in this department are the certificate of deposit register, C/D ledger, certified check register, tellers' records, duplicate clearing record, remittance and transit letters.

Machines Increase Efficiency. Machines have displaced human effort in handling this vast amount of work. Adding,¹ calculating,² bookkeeping³ machines, autographic

¹See Chapter V, Adding Machines.

²See Chapter VI, Calculating Machines.

³See Chapter VIII, Bookkeeping Machines.

registers,¹ check protectors and writers,² coin-changing devices,³ coin sorters, counters, and wrappers,⁴ addressing machines,⁵ together with machine posting equipment,⁶ such as ledger trays and cabinets, ledger desks, posting-machine desks, and loose-leaf equipment⁷ make the most complex operation a simple matter.

2. LOAN AND DISCOUNT ACTIVITIES

Lending money is one of the primary functions of a bank and it is through careful handling of this function that the bank derives a profit. There are four principal kinds of loans: (1) ordinary loans or notes discounted; (2) collateral loans; (3) mortgage loans; (4) bonds.

Notes Discounted. These are usually notes purchased from, or held as security for, loans to customers. The interest charge is often deducted at the time the note is accepted at the bank, but frequently at maturity of the note.

Collateral Loans. Bonds, stocks, notes, warehouse receipts, bills of lading covering goods in storage and transit are accepted as security for loans.

Mortgage Loans. Another type of loan is that which is secured on real estate. This is known as a mortgage, and most loans of trust companies and savings banks are secured by this kind of security.

Bonds. A bond is a fractional part of an evidence of debt usually secured by a lien on property, and specifies the time when payment of the principal is to be made. There

¹See Chapter XIV, Autographic Registers.

²See Chapter X, Check Protectors and Writers.

³See Chapter XII, Coin-Changing Devices.

⁴See Chapter XIII, Coin-Handling Devices.

⁵See Chapter XXV, Addressing Machines.

⁶See Chapter XXXIV, Filing Equipment.

⁷See Chapter XXXVIII, Loose-Leaf Accounting Records, Equipment, and Systems.

are several kinds of bonds, most of which bear interest coupons payable semiannually. These include mortgage, collateral trust, and debenture bonds, and so forth. Often there is a sinking-fund provision for the retirement of the bonds at maturity.

The bookkeeping and record work in connection with loans and discounts is a very important part of your bank account. The credit operations of a bank depend largely on information furnished by the liability ledger, record of maturing notes, and so forth. Loan records must tell you at a glance for just how much each customer is liable either directly or indirectly. The system should automatically show what notes are due or overdue.

Systems. Present systems of making loan records are a distinct departure from the old method. The practice of making several records at one writing has come into common use. There is what is known as the "triplicate loan" system which consists of the liability ledger, discount register, and the maturity tickler. A "quintuplicate" system consists of five sheets with five forms on each sheet; these are: discount register, direct liability, note notice, maturity tickler, and endorsers' liability sheets.

Machines and Equipment. Mechanical devices for writing these records and equipment for storing them in accessible places are part of the system and add a great deal to the efficiency of handling this line of bank activity. Accounting¹ machines, billing² machines, card files, steel and wood filing sections, and steel note files³ have been specially designed to take care of it.

3. MEETING THE PROBLEMS OF EXCHANGE

There are three kinds of items in connection with Exchange which must be handled every day. They are: regis-

¹See Chapter VIII, Bookkeeping Machines.

²See Chapter VII, Billing Machines.

³See Chapter XXXIV, Filing Equipment.

ter record or teller record items, collection items, and transit items. Attention will be directed to these items that have been deposited for credit, cashed over counters, charged through the mail, or items involved in some cash transaction that places them in the general statement of the bank.

Teller Records Items. "Self" or "Use" checks drawn on your own bank, certificates of deposit and cashier's checks; local clearance checks drawn against other banks in same town; outside checks and drafts drawn against banks in other towns; interest coupons, sometimes accepted for collection only, but frequently taken as cash; demand or sight drafts drawn against merchandise transactions, grain, cotton, and so forth, often accompanied by bills of lading and warehouse receipts; post-office and express company money orders and other miscellaneous items—all these various items are sorted as they come into the bank into their proper classes by the tellers or their assistants and listed for totals. They are sent to the several proper departments for disposition, to be taken into account in the day's settlement.

Collection Items. Banks are continually handling checks, notes, drafts, and other items sent for collection and return of the proceeds. Pure collections are items on which no debit or credit has been issued or cash advanced. Local depositors of the bank often have collections to be made locally and they are placed in the bank's hands because it is convenient and also because it is a part of the bank's business to do this kind of work. Items payable elsewhere which come into the bank's hands and must be forwarded to out-of-town banks to be collected are known as foreign collections.

Transit Items. Those classes of outside items consisting of checks, bank drafts, merchandise, cash drafts, money orders, and so forth, received by a bank, constitute the main portion of its deposits in other banks. The letter used when sending

out foreign items for credit in its agent or correspondent bank is termed "exchange letter," "remittance letter," or "transit letter." So large a volume of transit items finds its way into banks that larger banks maintain a "transit" department for handling this part of the work.

Keeping Records of Exchange. Bankers all over the country are substituting up-to-the-minute systems for keeping the numerous records necessary in handling exchange items. There are loose-leaf or card records for almost every department. There is a loose-leaf combined register plan that takes the place of the old-fashioned bound register. Instead of a half-dozen or more, separate bound registers, one or two loose-leaf binders, properly indexed, do the work. An adaptation of the duplicate clearing record may be used in practically every bank regardless of size. A triplicate system for "returned items" is being used to facilitate the handling of the details of returned items. Because the use of manifold forms for recording collections enables the accomplishment of all necessary routine in one writing, such systems as the "duplicate local collection plan" and the "duplicate foreign collection plan" are rapidly superseding old-style methods. Many banks are using the American Bankers Association Numerical Transit System for handling transit items.

Machines¹ and Equipment.² Up-to-date machines and equipment should be installed if a bank is to keep its work up to par. Much more can be accomplished in the course of a bank day if all records are done on one of the machines designed for that purpose. Typewriters, bookkeeping machines, and adding machines are made to do this work efficiently and at a minimum of cost. Posting trays and cabi-

¹Read Chapters V, VIII, and XXI for uses of Adding Machines, Book-keeping Machines, and Typewriters.

²Chapters XXXIV and XXXVII deal with Filing Equipment, and Loose-Leaf Accounting Records, Equipment, and Systems.

nets,¹ ledger desks, posting-machine desks,² binders,³ steel filing sections,⁴ for current and permanent filing, leave little to be desired in the way of proper equipment for the modern banking business.

4. TRUST DEPARTMENT ACTIVITIES

Such departments are organized to act as "trustee" for corporations or individuals and, as such, have certain activities which are tied up in records. The two classes of trust activities are corporate and individual.

Corporate Trust Activities. These activities consist in acting as agent in the transfer of capital stock from one person to another, as registrar for recording the cancelation and issuance of shares of stocks or bonds, and as a payer in the disbursement of funds. The trustee may take entire charge of the corporate records of the company or corporation.

Individual Trust Activities. Such activities may include: executor of estate named in will; administrator of estate, acting as trustee, guardian, receiver, assignee and so forth, by court appointment. Sometimes persons yet living put part or all of their estates in the hands of trust companies. In these cases, all details of the handling of an estate are taken care of in the regular way. This includes the collection of all revenues, handling of real estate, purchase and sale of securities, and the handling of managing expenses.

Systems. Banks have found that adequate accounting records and methods save much time and many dollars. Some of the practical forms used to make the keeping of trust records easier are: trust docket or minutes; trust inventory; record of trust receipts and disbursements; trust ledger.

¹See Chapter XXXVIII.

²See Chapter XXXIV.

³See Chapter XXVIII.

⁴See Chapter XXXIV.

Machines¹ and Equipment. Adding, calculating, and bookkeeping machines keep the kind of records that are necessary in handling trusts. In the trust department one of the most important operations is filing. Every paper, document, and record must be kept in its proper place so that it may be found instantly and at any time. Among the wide variety of steel or wood files there is one that will adequately serve your needs. Posting desks, ledger trays, and ledger desks also speed up work.

5. SAFE DEPOSIT

A well-organized safe deposit department can be made to contribute liberally to the profit account. It rounds out a complete bank service and is of advantage in bringing new business to other departments of the bank—commercial, savings, investment.

The phenomenal increase in the number of security owners and keen competition in the banking business have caused almost every bank to include in its service to the public the facilities of a safe deposit vault.

Transactions pertaining to boxes and the activities of their renters must be properly recorded if the bank and its customers are to be adequately safeguarded.

Systems. The forms available for one complete system are, the agreement or contract between bank and renter, record of visits, daily summary of safe deposit department activities (rentals, renewals, new customers, and so forth), triplicate rental receipt, renewal notice and box number memorandum (all made in one writing with carbon-paper).

Another system takes care of safe-rents, charge for cost keep, jimmied locks, and the safe keeping of larger packages, all forms being made at one writing.

Machines and Equipment. Among the mechanical aids

¹Read Chapters V, VI, and VIII for information on Adding, Calculating, and Bookkeeping Machines.

for caring for the records of the safe-deposit department are autographic registers, addressing machines, typewriters. Storage of safe-deposit records is an important item which should not be overlooked.

6. GENERAL AND ADMINISTRATIVE

Aside from its activities in connection with its customers a bank has duties which require a considerable amount of time and a number of records. Most banks have shareholders who have a voice in the management of the bank's affairs. They elect the board of directors who in turn delegate powers to a president, vice-president, cashier and his assistants. The number of officers varies with the size of the institution. To carry on the work of administration it is necessary that complete data be kept of the business. This involves many phases not apparent to the layman.

Systems. To aid in the successful administration of a bank, record-keeping systems such as stockholders' ledger, minute record, general ledger, daily statement of condition, distribution of expense, distribution of income, debit and credit tickets, dividend register, expense voucher system, and reserve statements, have been devised. Today there is no phase of the banking business that cannot be systematized.

Machines and Equipment. As a means of saving time and money in the general and administrative departments, as in all other departments of a bank, there is no better way than installing proper mechanical devices to take care of routine work.

COMMERCIAL INSTITUTIONS

The second enterprise to be touched upon in connection with systems and their uses is "commercial." The term may be said to include, specifically, retailers, wholesalers, and manufacturers. It is obvious from the very outset that

the systems applicable to one may not completely cover the activities of the others. However, the general functions are very much the same, and what is generally said of one may be equally true of the rest. With the exception of the production activity in manufacturing, the basic activities of the three types of commercial enterprise are similar.

The advent of machines and systems in the commercial field has been somewhat slower, generally, than in the banking field. However, the commercial field is coming to the front in the matter of mechanical handling of records and almost every day some new use is found to which systems and mechanical devices may be put.

Mechanical bookkeeping¹ has effected a great improvement in handling customers' accounts and forwarding statements promptly. All the work formerly done by hand has given way to a method which is neater, more accurate, and more efficient. When the end of the month comes around, it isn't necessary to put the whole office force to getting out "bills." The regular bookkeeping staff, with the aid of machines, can easily accomplish the work.

Along with mechanical posting as a means of rapid work come loose-leaf binders² for records, addressing machines,³ calculating machines,⁴ tabulating machines,⁵ files,⁶ and many other labor-saving devices. The larger the business organization becomes, the greater the need for such aids. Big business cannot endure on the old "human effort" system of taking care of its clerical work.

FOUR FUNCTIONS OF OFFICE ROUTINE

Office routine in any commercial institution embraces the

¹For information on mechanical bookkeeping, read Chapter VIII.

²See Chapter XXXVIII, Loose-Leaf Accounting Records, Equipment, and Systems.

³See Chapter XXV, Addressing Machines.

⁴See Chapter VI, Calculating Machines.

⁵See Chapter IX, Tabulating Machines.

⁶See Chapters XXXIII and XXXIV on Filing.

performance of four functions. This is true in any business, whether retail or wholesale, and is also applicable to manufacturing, with the added function of production. The functions are: *buying, selling, administration, and production*. Just how closely they are related may be gathered from the fact that should one function fail to measure up to the standards set for it, the entire system is thrown out of gear.

Looked at from a broad view-point, it may be said that the activities of the three types of commercial businesses classify as shown below. The first nine items are covered in this chapter, while the tenth item is covered in Chapter XXXIV.

- | | |
|--------------------|------------------------|
| 1. Buying | 6. Billing |
| 2. Stock-keeping | 7. Customers' Accounts |
| 3. Paying | 8. Collecting |
| 4. Handling orders | 9. Accounting |
| 5. Shipping | 10. Filing |

Each of the ten classifications listed above is a definite step in making a profit, and it must be handled with the utmost care. A mistake in any one of the steps is apt to cause a great deal of confusion and to result in a loss to the business. It is, therefore, imperative that proper equipment for tracing each step carefully be used.

BUYING

Good buying means buying the best article for a given purpose at the right price. There are four activities in connection with buying: (1) placing the order; (2) receiving and inspecting the goods; (3) recording value, quantity, and cost; (4) paying.

Placing the Order. Any buyer should have the facts of the business before him. He must know when, what, and how to buy. He must know how the customers have been buying and on what basis. After he has these facts well in mind he is ready to place the order.

There should be a system whereby there will be no duplication of orders and overbuying. Records of the amount of goods ordered but not yet received must be kept. All orders telephoned or wired should be confirmed in writing on regular forms or store stationery and marked "Duplicate confirming wire (or telephone) order."

In case one buyer handles purchases for more than one department, each order should be entered on order blanks belonging exclusively to that department. Order blanks should be made out in triplicate, one copy of which is sent to the shipper (original), another copy retained by the buyer, and a third copy for the merchandise manager and then the office.

A record is made of the order in the bookkeeping department showing the date placed, amount and number, department classification according to time goods are to be delivered, total and general remarks. The order is then filed until the invoice arrives. Cancellations are recorded in red ink on the duplicate and in the office record. When the invoice arrives it is checked against the duplicate order to catch shortages, unauthorized shipments, or partial shipments. Prices and terms are checked and the order is filed in the office permanently.

Receiving and Inspecting Goods. When the goods are received they are checked from the invoice for possible shortages, duplications, or wrong goods, and for price. They are inspected for breakage and imperfections and when found o.k. are placed in stock. The invoice is then sent to the bookkeeping department where the amounts are to be posted to the merchandise account in the general ledger.

Recording Value, Quantity, and Cost. Before the invoice is sent to the bookkeeping department to be filed away, the buyer notes the selling price to be marked on the merchandise. Thus the selling price becomes the basis of all computations, such as percentages of expense, mark-down, and profits.

Paying. After the goods have been purchased, received, and inspected, the next step is payment. Suitable records should be kept of incoming merchandise and the terms of payment so that advantage may be taken of discounts. Unless accurate records are kept, discount dates are apt to slip by unnoticed. In any business such discounts count up rapidly.

Machines which enable the writing of "remittance advice" with any desired number of copies on a "vendor's ledger and record of invoices," make it possible to write the vendor's check, charge the ledger account, enter the complete transaction, including the amount of discount earned, on a check register, have been devised to do all of this work in a very small number of operations. The application of machines to accounts payable has considerably cut down the number of operations necessary to record transactions, the receipt of goods, and the payments in settlement.

SELLING

There are four major activities in selling which must be carried out with accuracy if proper results are to be obtained. These activities are order-writing, shipping, billing, and accounting, each of which may be handled in a systematic manner with promptness.

In *order-writing*, several copies are made of a customer's order. One is sent to each of the following: the customer, as a confirmation; billing division, filed to await receipt of notice of shipment and supporting documents; sales department, attached to customer's order in "pending shipment" or unfilled order file, and used as a follow-up; purchasing department, used only when material must be purchased specially; production department, for office use and for factory departmental use; cost division, used as basis from which to figure cost of goods sold; stores department, authority to issue materials—it shows the order or account to which materials issued later will be charged; shipping department,

authority and instruction to prepare material for shipment when available (shipping is noted on this copy and sent to traffic department, which forwards it with document to sales department, from which it goes to the billing division); traffic department, authority and instruction to ship material when available.

Shipping. Among the various records which are necessary in scientific handling of shipping are bills of lading, parcel-post and express receipts, local delivery sheets, shipping labels, packing slips, and receiving reports. Some form of any of these records is essential if an organization is to know how merchandise is delivered and if it has been received in good condition by the customer. Such forms are invaluable in tracing lost shipments. The preparation of these forms is made in duplicate or triplicate by machines which eliminate a great deal of error.

As each shipment goes out, a record of it is sent to the accounting department and the billing department, where the account is posted and the customer billed for the merchandise shipped.

Billing. The entire bill from the customer's name to the amount due can be taken care of on a single machine, especially designed for that purpose.

After the goods have been packed and ready for shipment, the order is sent to the billers who record, in any number of copies desired, the items that are included in the shipment. Items omitted in packing are noted on the bill but not added to the total. Such remarks as "back order" or "out of stock" may be made opposite each article thus omitted.

The bill, as presented to the customer, is an itemized statement of the goods he should receive in the shipment. From it he can check his order, note any discrepancies in it, and ascertain wrong shipments, substitutions, and incomplete orders.

Accounting. Following the handling of a customer's or-

ders through the various stages, comes the final step—accounting. In this activity, record is kept of the amount due the company, cash received from the customer to apply on his order, discount allowances, rebates, deductions for overcharges, and adjustments. Statements are prepared from the account and sent out monthly to the customer.¹ Speed and accuracy are essential to accounting, and both can be obtained by machines and systems that have been devised for that purpose. How well those machines have accomplished their mission may be determined from the vast number of businesses that have installed them.

ADMINISTRATION

The problems of administration are of primary importance and are of such a complex nature that slipshod methods will wreck even the most financially sound institution. It is imperative, therefore, that scientific methods be employed in handling the administrative phase of any business, however large or small.

In connection with administration there are activities which must be checked accurately in order to ascertain to a fine point just how different methods will solve the problems. Minute books, property records, stockholders' ledger, asset registers, and numerous other records must be handled with the greatest care and accuracy. To meet the requirements of the problems of administration, machines, such as accounting machines, adding and calculating devices, and many others, have been devised and each accomplishes its work in a way that human effort cannot duplicate.¹

An efficient filing system is an indispensable part of any business. This is especially true where a vast number of papers must be stored away for future reference. Time consumed in rambling through old records is lost time if there is a possibility of keeping filed records in an orderly

¹See Chapters V, VI, and VIII on Adding, Calculating, and Bookkeeping Machines.

fashion. Ease in locating data is almost as important as finding those data.¹

PRODUCTION

The problem of production is found chiefly in manufacturing businesses, and what is said of scientific management of this phase of commercial endeavor would hardly apply to wholesale and retail enterprises. In connection with production there are certain kinds of systems which show the production manager exactly the relationship of his end of the business with the other phases.

It is obvious that close cooperation between his department and other departments is absolutely necessary. He must know if sales are running ahead or behind production. He must know whether or not costs of production are too high or production is insufficient to meet overhead expense. Accurate current data are therefore as important to him as they are to the administration. He learns the requirements of the customers and whether or not his department is capable of supplying the demand for the company's product.

In figuring selling price, cost of production is the central figure. It is necessary for the production manager to know, and to have a means for establishing, a cost price which will completely cover material and labor expenses. He must have a complete system for cost accounting, for recording machine and man production, pay-roll records, personnel records, material in stock, orders, and various other records. With such data at his command he can work out ways and means of reducing production costs. To the layman this appears to be a mighty undertaking and one of primary importance.

Such machines as accounting, calculating, tabulating, time clocks, job-time recorders, elapsed-time recorders,² and

¹See Chapters XXXIV and XXXV for full information on Filing and Indexing.

²See Chapters VI, VIII, IX, and XXIX, on Calculating, Bookkeeping, and Tabulating Machines, and Time Recorders.

such record forms¹ as perpetual inventories, material records, pay-roll, machine production, personnel, enable him to arrive at definite conclusions in regard to his particular department.

PUBLIC SERVICE CORPORATIONS

When the number of patrons is taken into consideration it is easy to see that the organization of a Public Service Corporation is very complicated and the need for promptness and accuracy in dealing with patrons is absolutely essential. If one were to X-ray the organization of a public utility one would be amazed at the number of records involved and the need for modern systems to handle the business of the company. From the smallest item to the largest, there is a network of records to astound the most imaginative layman. He may call it all red tape, but it is of such importance to the organization that it cannot be dispensed with. Without this network of records there would be a jumbled meaningless mass from which there would be no recourse.

In all public service corporations there are *buying, recording of stock, paying, sales, and revenue activities*, each of which must be accurate and complete. Because of the usually low rate at which these companies sell their commodities or service it is apparent that volume must make up the difference. The handling of a tremendous volume of business means involved procedure which, in turn, means a large number of people to take care of the records. To reduce the overhead of keeping accounts of the various activities it has become necessary to employ mechanical devices to cut down the number of bookkeepers, accountants, statistical clerks, billers, and so forth.

Buying, recording of stock, and paying activities are similar to those discussed in commercial enterprises and it would

¹See Chapter XXXVIII on Loose-Leaf Accounting Records, Equipment, and Systems.

be merely repetition to go into this phase again. However, sales and revenue activities are of a different nature, due, largely, to the fact that public utilities sell a service rather than tangible merchandise.

Public utilities may be classified as: gas, electric, and water companies; railroad, steamship, and express companies; telephone and telegraph companies.

GAS, ELECTRIC, AND WATER COMPANIES

Activities in the first group may be listed as order-writing, servicing, billing, collecting. Of this classification, servicing and collecting are much the same as in commercial enterprises with the possible exception of forms.

Order-Writing. This activity consists of writing work, inspection, repair, and cancelation-of-service orders. If a public service company serves a large community, there is need for speed and accuracy in dealing with the customer. As good-will is the all-important feature of a public service, the surest way to gain it is by promptness in taking care of a customer's needs. A copy of each order must go to the department for which it is intended, and, if a charge is made for service, to the bookkeeping department.

Every company has a printed form which is used to write out inspection, repair, and cancelation-of-service orders and is the authority for the performance of such jobs. Many such requests are telephone orders, and blanks are filled out without the aid of a machine.

Cancelation-of-service orders are prepared with copies for that department, one for the billing department and one for customer's accounts department and other departments that must know all about the customer. As most gas, electric, and water companies allow their patrons to purchase merchandise on the deferred payment plan on their bills, such information as cancelation of service is important to the sales department.

Billing. Billing for consumption of gas, electricity, or water is done by a machine which specifies the meter reading, the amount consumed, the rate, total amount due the company, and the discount with a new total if bill is paid before a certain date. Billing merchandise for which payment is to be made on gas, electric, or water bill is added with the use of a separate form.

*Systems and Machines.*¹ To accomplish all of this work promptly and accurately would require a vast number of clerks if attempted by hand methods. With the use of forms and machines it is possible to eliminate much routine from the time readings are turned in by the meter department until the customer receives the bill. Billing machines, calculating and addressing machines, and bookkeeping machines do away with slowness and inaccuracies.

RAILROAD, STEAMSHIP, AND EXPRESS COMPANIES

In connection with this type of public utility corporation it may be said that the nature of their service does not affect as many people directly as does the service of gas, electric, and water utilities. Indirectly perhaps they serve as great a number of people as any other public business organization. In classifying their activities it is imperative that the service itself be divided into two classes, that is, passenger and freight.

Passenger Service. Adequate records of details in handling passengers must be kept. An abstract of all tickets sold in every depot on the line, a division statement, incoming passenger manifest, all such records must be as accurate as any other record of the company. Regardless of the source of revenue, the work in the minor department is as important as the activities in the major division, although carried on on a less extensive scale.

¹Read Chapters VI, VII, VIII, and XXV on Calculating, Billing, Book-keeping, and Addressing Machines.

Freight Service. In this division of a public utility there are numerous activities which may be handled systematically by use of forms and proper machine equipment.¹ Way-bills and daily abstract of way-bills forwarded, daily abstract of way-bills received, freight bills (collect and pre-paid), passing reports, permits, bills of lading, loading list, and freight claims are kinds of records used by all railroad, steamship, and express companies of today.

A number of these records may be written at a single operation where the information carried on one is similar to the other; provided, of course, that the forms used in making these records are similar, to a degree.

Where certain forms are sent to the shipper, the receiver, and retained by the company, it has been found to be efficient to use machines to write any number of copies at a single writing. Machines to handle this work are being used wherever it is convenient. Even in cases of smaller companies the legibility and accuracy of machine-written records are far superior to the hand-written, and, in case of disputed claims, the machine-typed record has no equal.

TELEPHONE AND TELEGRAPH COMPANIES

The next classification of public utilities which has a direct and essential bearing on the general public is the telephone and telegraph companies.

Records used in connection with customers' accounts are similar to the records of any gas, electric, or water company in so far as these companies are alike. There are repair and work orders, cancelation or installation of service orders which deal almost directly with the consumers' and customers' accounts. This last item in any public utility is of vast importance and has, perhaps, the largest department in the entire organization. In all events the utmost care is taken in the handling of this phase of business. Machines and

¹See Chapters VII and XXI on Billing Machines and Typewriters.

forms have taken the place of clerical help and have brought about greater efficiency in handling accounts.

In intricate organizations such as are mentioned in the foregoing discussion the development of machine and form devices to facilitate the handling of routine work has been rapid. Displacement of clerical forces has been an advance step toward efficiency and economy and has been a means of establishing that all-essential element in public utility service—Good-Will.

HOTELS AND CLUBS

Perhaps no business has a greater need for efficiency and economy than hotels and clubs. In most cases the layman sees only the service side of such enterprises and does not consider the vast number of details which must be gone through to provide him with necessities and luxuries which are found in hotels and clubs. The clerk behind the desk who assigns him to his room or the waiter who shows him his table seem to go about their respective jobs without thought of efficiency or system.

The successful management of hotels and clubs depends entirely upon a systematic arrangement for record-keeping. In this feature of the business there are few differences from every other enterprise. There is the good-will of the guest to maintain and all efforts should be directed to gain that end. Faulty records or inefficient methods go a long way toward breaking down good-will which can be retained with a little effort and satisfactory systems for providing for the welfare of the guest.

Hotels and clubs have records pertaining to their business just as banks and commercial and public service corporations, as far as the handling of routine is concerned. It is this phase of the business with which the layman is familiar. Buying, paying, recording of stock activities, general ledger, minute books, and property ledgers are a part of the system pertaining specifically to the operation of such busi-

nesses aside from their dealing with their customers—the guests.

Guest cards which contain the name and address of the guest, the room to which he is assigned, the rate and the date of arrival, together with such information as transient or permanent guest, are prepared when such information is available. Other cards for the bookkeeper, switchboard operator, and the room clerk are filled in with the information each requires and placed in a rack in alphabetical order for telephone and bookkeeping purposes, and filed in room number order for the room clerk or manager. These cards may be filled in at a single writing with machines and duplication devices.

Permanent guest records are filled in from cards, and the amount due at the end of a specified period, usually a week, is posted on special forms. These forms contain an itemized statement of the guest's expenditures during the week, such as, cafe, valet, telephone, cigars, c.o.d.'s, and other miscellaneous items which may be provided as part of the hotel or club's service to its patrons. Such bills are made out in duplicate or triplicate on machines¹ designed for that purpose and on forms specially provided for that feature of hotel and club record-keeping.

From this statement the amounts may be posted to the customer's account. All bills secured during the week are sent to a central office, where the items are sorted according to room number and guest's name. After they are sorted in the proper order it is a matter of routine to post the customer's account.

The hotel and club field has only recently been opened to uses of mechanical machines as a means of preparing guests' accounts. Many companies have discovered the possibilities in this line and are providing mechanical devices to aid in record-keeping in the various departments into which a club or hotel is divided.²

¹See Chapters V and VI on Adding and Calculating Machines.

²See Chapter VIII, Bookkeeping Machines.

Items may be listed according to date, subtotaled, totaled, and posted to the statement by merely depressing the keys. Duplicate or triplicate copies are made to be used as guests' statements and for bookkeeping purposes.

In the case of a transient guest all bills are sent in immediately and posted on his account so that in the event of his checking out at any time his bill will contain all items to be charged. Any system which cannot supply speedy service to the guest is detrimental to the best interests of the hotel or club and the guest.

Another record which does not make itself clear to the layman but is of vital importance to hotels and clubs is the stock-room record. This is a form of perpetual inventory. All merchandise received in stock is listed, and as it is used up, the amount and cost are checked on a special form which is sent to the bookkeeper to post against the account of the department requesting the goods. By this system an accurate check is kept on all items and it facilitates the establishment of an accurate expense account.

Other records such as columnar revenue analysis, revenue journal combined with revenue ledger accounts, aid materially in recording the activities of the hotel and club management. Bookkeeping, adding, and calculating machines¹ and other devices aid materially in handling accounts and keeping records in order.

INSTITUTIONS

Perhaps, in the past, little attention has been given to the requirements of institutions such as hospitals, asylums, and sanitariums in regard to a systematic handling of accounts. Except in the case of very large institutions, officials within the institution have overlooked the possibilities of scientific equipment in handling the routine work that must be carried on wherever a service is supplied. It is its

¹See Chapters V, VI, and VIII, Adding, Calculating, and Bookkeeping Machines.

connection with the general public which makes it necessary to keep records of any kind and, as all lines of endeavor are in existence to serve the public and derive their revenue from that source, method must enter into all dealings with the public.

Not only does the question of financial records enter in the general scheme of institutions, but attention must also be given to records for keeping data regarding the persons under the care of the institutions. In many instances this is a complicated undertaking and must be handled with care.

Accuracy is the vital item in connection with records of any institution. Again, as in other organizations, the volume of work must be taken into serious consideration before systems and mechanical devices are installed. A system for handling records must be devised with the requirements of the organization in mind. There is a system, or a suitable one can be devised, to meet the needs of any institution, whether large or small.

A suitable form of record of this type contains the following information: register number, days paying, rate, private nurse record, physician, patient's name and address, how settled, admitted and discharged. It may be seen from this list how the data concerning the patient's financial responsibilities and other information are recorded on a single sheet. In large institutions where there are a great number of patients and a vast number of accounts and records to be made, it makes for economy and efficiency to employ machine methods.¹

As a general rule, manufacturers do not carry these as stock forms, but make them up after the requirements of the institution have been studied and a system devised. It is obvious that forms applicable to one would not be applicable to another. As in the case of hotels and clubs it has been found advisable to make special machinery after a complete survey has been made. It often happens that,

¹See Chapter VIII, Bookkeeping Machines.

after such a survey, systems are devised which handle two or three jobs at one operation.

In the case of schools, colleges, and universities, where there is need for cooperation between various departments, the application of systems is very imperative. All schools are run on a budget plan in some form or other and it is necessary to remain within that budget. Funds are obtained from such sources as municipal, county, and state governments, bequests, alumni subscriptions and endowments and, unless an accurate check is kept of all disbursements of funds, serious difficulties are apt to arise. It is absolutely necessary for institutions of this type to stay within their means unless they have other sources of revenue to draw upon should the contingency arise.

It is apparent, therefore, that in institutions such as schools, colleges, and universities there is a real need for systems and mechanical devices to cut down the overhead. A survey of the various chapters on machines and equipment will show how economical and efficient systems may be employed to supplant clerical help to a great extent.

The need for systems in handling accounts and in dealing with customers in all lines of business, has been pointed out in the foregoing discussion. It is, perhaps, due to the complexity and the comprehensiveness of business enterprises that the need is most keenly felt. However, even the job that is taken care of by one or two men often requires the help of certain forms and devices to deal with the routine work not an integral part of the job itself. This is particularly true in the case of the professions.

PROFESSIONS

The application of complete systems depends entirely upon the volume of business a professional person does. In some cases it is not advisable to install an elaborate equipment which would hamper the successful adaptation and defeat the very purpose for which it was intended. The

simplest system is usually the best in enterprises where there is not a very great volume of business and the services of a trained bookkeeper are not required.

Within the last decade, companies have awakened to the need of professional people for forms and devices for the successful handling of accounts. As a result, there are on the market today forms suitable to the needs of such professional records as doctors', dentists', and lawyers' appointments, and data concerning cases and payment.

Forms,¹ which bear the name and business and home addresses of the patient, reference, description of operation, description of payment and other information of value, are now a part of the equipment to be found in every professional office. Appointment books, showing the name, day and hour, kind of work to be done, and the cost of such work, are handy and enable the owner to know and plan his day accordingly. Such notations as progress of the work, amount of partial payments, and the like, may be entered in the appointment book and later transferred to whatever type of ledger may be used.

Several manufacturers of equipment have devised forms which meet the needs of the professions without adding materially to the routine work. The salient features of these forms are the compactness of all data concerning a patron and the work he requires and the simplicity of handling the financial details such as cost, cash or partial payment balance due. As in the case of doctors where payments are made as the service is rendered, it is obvious that a misunderstanding might arise if a proper notation is not made of such payments. By the partial-payment plan, services are generally paid for by the time the work is completed. This removes the necessity of sending out statements except in the case of delinquents.

Where the volume of work does not warrant the employment of a bookkeeper and the adoption of mechanical de-

¹See Chapter XXXVIII, Loose-Leaf Accounting Records, Equipment, and Systems.

vices for handling accounts, suitable systems are available in other types of loose-leaf equipment which will adequately serve the needs of professional people. Such methods as the autographic register system¹ enable the professional people to keep adequate records with a minimum of effort.

MISCELLANEOUS

There are a number of businesses which cannot be classified in any specific field, due chiefly to the nature of their particular field of endeavor. True, all businesses have some things in common and certain activities are to be found in all types of enterprise; nevertheless, certain functions must be performed in a different manner from routine in banks, commercial enterprises, public service corporations, and the like. In order to bring them within the scope of the *What*, *Why*, and *How* of systems, they have been listed as miscellaneous. The relative importance of such organizations and their bearing on the business world are in no way lessened by this classification.

Several such organizations which have records common to all business and specific records peculiar to their particular lines are: brokers, insurance (home office and agency), municipal, county, state, and federal offices. It may be readily seen from this list why there is a need for special forms and special equipment in handling the routine work. It is assumed that such phases as buying, paying, original and summary entry, general ledger, general purpose and stock activities are very much the same and require about the same process, systems, and mechanical equipment.

Brokers. It may be readily seen why a brokerage firm needs a system and equipment peculiar to its own interests when one stops to consider the type of work it does and the variety of records it must keep.

Among some of the forms used which can be handled

¹See Chapter XIV, Autographic Registers.

on machines are execution list, customer's confirmation notice, and sales journal, margin ledger, blotter—a book in which transactions are entered as they are made—security ledger, wire accounts, contingent list and clearing-house tickets, syndicate ledger and foreign exchange accounts. Various types of writing machines may be employed in making entries in a legible and efficient manner. Whereas hand methods might work to the detriment of the customer and broker, machine equipment and suitable systems place all transactions on the records in a satisfactory fashion.

Insurance. This classification has been subdivided with two parts: home office and agency. Home office activities consist of policy writing, premium register and cards, agency ledger, summary of accounts current, return premium register and cards, reinsurance registers and claim records. Where there are a great many different types of policies handled daily, as is the case in most insurance offices, there is a place for machine equipment to handle the volume of work. All information and data on any form of insurance policy must be written legibly and accurately, and any errors and misunderstandings may be avoided by doing the work with writing machines.

Agency records and activities consist chiefly of policy and application writing, insured records, broker's statement, company accounts current and reinsurance register. Original policies are usually written in longhand and forwarded to the home office where machines are used to fill in policy-holder's copy. All signatures and other data written in longhand are photostated and a copy is attached to and becomes a part of the policy.

Municipal, County, and State Offices. The activities in these offices center around taxes and budget. In any such office there is the necessity for accurate records. The tax roll, rate, assessments must be legible and accurate and must be reliable. If there is an error in any of the records, there is apt to be an error in the final accounting of the municipal,

county, and state funds. To avoid this possibility, mechanical devices, such as adding, calculating, and bookkeeping machines, are used almost universally.

Budget or appropriation ledger and summary activities constitute the chief activities in the disbursement of funds. As officials are responsible to taxpayers for the appropriation of such funds as are derived from taxes or other sources, these records must constitute an authoritative statement of budget and appropriation activities.

Federal Offices. Tax, Indian agency accounts, money order, budget or appropriation ledger, and summary are a few of the major activities which are handled by the Federal Government. To list all of them and show how systems and equipment have added to the efficiency of federal offices would constitute a book in itself and would be of little value to the reader except for his own information. Almost all of the mechanical devices and forms which are to be found in every-day business are used in federal offices. In many instances the need of the government for automatic devices has led to inventions which have later developed into valuable assets to the business world.

V

ADDING MACHINES

The quest for mechanical calculators began thousands of years ago. The adding machine serves one purpose, the calculating machine another. Early efforts to perfect an adding-listing machine. Later improvements. Consider these points before buying. Principles of operation. How adding machines are classified. Features common to all. Straight adding machines: full-keyboard type; ten-key type. Duplex machines: full-keyboard type; ten-key type. Cutting corners in figuring.

WHEN man began to barter, to sell, the need for arithmetic was born. But the calculations that must accompany all exchange, simple as they may be, were, even at that remote period, considered burdensome and unsatisfactory, with the result that a substitute was sought from the start. This continuous quest for mechanical substitutes for mental arithmetic has its place in the history of the Egyptians, Syrians, Greeks, Romans, Incas, and Chinese, who all procured a figuring device of practically the same degree of usefulness.

One of the first semimechanical figuring devices was the abacus, with which many calculations could be performed. It was constructed with seven long and seven short rods or bars. The former had four perforated beads running on them, and the latter, one. One bar indicated units, another indicated tens, and so on, up to millions. The beads on shorter bars indicated five units, five tens, and so on.

The Chinese swanpan, known to have been in use over 2,000 years ago, closely resembled the Roman abacus in its construction and use. Computations were made by means of balls of ivory running on slender bamboo rods. In appearance the swanpan looked much like the board fitted with beads strung on wires which is sometimes used in teaching the rudiments of arithmetic.

The stories which have been handed down of the early at-

tempts to construct an adding machine record practically all failures; however, they point to the fact that even as early as 960 the idea of a machine which would calculate was conceived. Between 960 and 1020 there are three Europeans who are recorded as working upon calculating devices: Gerbert, educated by the Moors; Magnus, a Spaniard; and Bacon, of England.

Little is known about further developments of calculating machines over a period of 600 years. Records show that in 1642 Blaise Pascal, a French philosopher and mathematician, devised a computing machine which, it is said, would add, subtract, multiply, and divide. In 1663 Sir Samuel Moreland, an Englishman, completed a compact and simple disk calculator, similar to the small disk calculators in use today. In the latter part of the seventeenth century, John Napier, of Scotland, devised the multiplication square rod which was used throughout England with more or less success. Gottfried Wilhelm Leibnitz, the great mathematician, scholar, scientist, and diplomat, in 1671 developed a machine which facilitated multiplication.

Records of inventions for figuring machines next seem to skip to the early part of the nineteenth century, when mathematicians again attempted the designing of machines to do away with mental drudgery. The best known among these is Charles Babbage, an Englishman. In 1822, with the aid of the government, he began the construction of a "calculation engine." This great calculation engine, however, was never completed, as the constructor apparently desired to adopt new principles when the first specimen was nearly finished. A model of his machine stands today, labeled "difference engine," at King's College, London. Another inventor of this period, Charles Xavier Thomas, a director of a French insurance company, in 1820 developed the first successful calculating machine. This pioneer "automatic" calculator, or adaptations of it, has been manufactured under such names as Tim, Saxonia, Peerless, Tate, Archimedes, and so forth.

THE ADDING MACHINE SERVES ONE PURPOSE, THE CALCULATING MACHINE ANOTHER

At this point in the history of the calculating machine, it seems advisable to digress a bit for the purpose of making a division of the subject for greater ease and simplicity of presentation. And since this digression has as its object the more or less arbitrary division of figuring machines into two distinct groups—so-called *adding and listing* and *calculating* machines—perhaps a few paragraphs on the reasons for this division will serve to clarify the reader's mind.

An adding-listing machine or a calculating machine usually means to the average person any machine which may be used to add a column of figures. But, in truth, all kinds of various types of figure work can be handled mechanically. Addition, subtraction, multiplication, and division can be performed on an adding-listing machine or a calculating machine. The adding-listing machine prints the items as it is operated, while the calculating machine indicates them without printing.

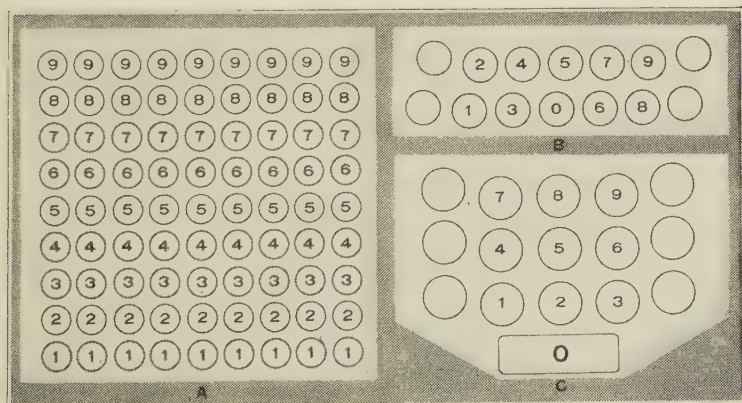


Figure 1: The three diagrams of keyboards shown above illustrate the full-keyboard type and the 10-key type. In the full-keyboard type, illustration A, the keys are arranged in rows of 9 keys each. Illustrations B and C represent two different styles of the 10-key type.

Calculating machines are key-driven or crank-operated. The adding-listing machine is hand-operated or motor-driven, and, as already stated, prints a record of the items added. Each type has been designed to do special work; each has its place in handling figure work and should not displace the other.

When records of figure work are needed for checking and proving the work, for filing, or to make statements of accounts, the adding-listing machine serves the purpose. On the other hand, when rapid addition, subtraction, multi-

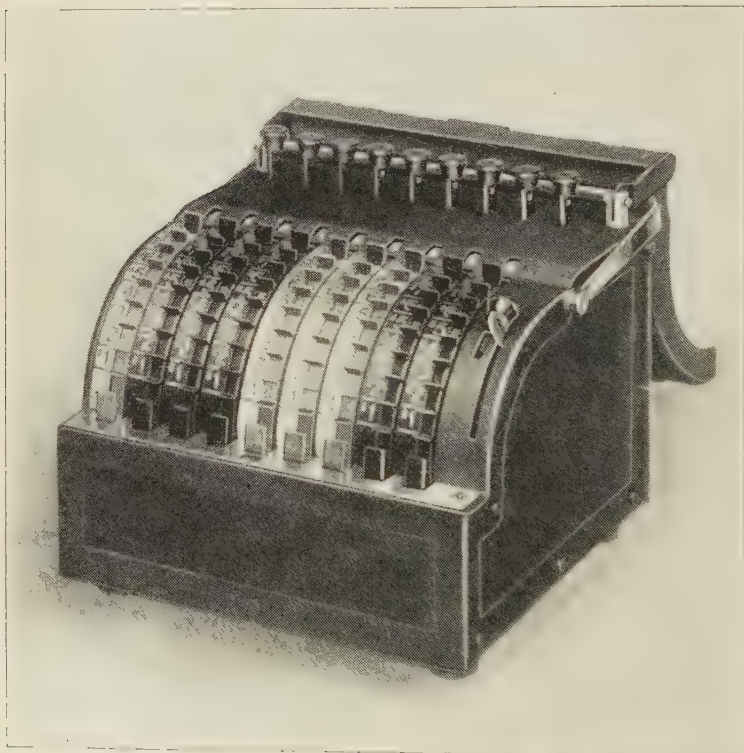


Figure 2: The adding machine shown here is equipped with pull-down lever keyboard. It does not print or record items added. Amounts are set up by means of the levers—notice that there is one for each number in each column. See page 71.

plication, and division are to be performed without the need of a printed record, the calculating machine fills the need quite satisfactorily.

So, for the purposes of this book, figuring machines will be taken up and handled under the following broad classification: First, all adding-listing machines are covered in this chapter on Adding Machines; second, all machines which do not print and are used for *all* forms of calculation will be taken up in a later chapter on Calculating Machines; third, the other types of figuring machines, such as Book-keeping Machines, Billing Machines, and so forth, will be covered in separate chapters.

Much of the development on these several types was necessarily contemporaneous. The development of the one type



Figure 3: No mistake is more dangerous to profits than an error in figures. Therefore, even the smallest office or shop or store must have an adding machine to guard against these blunders. There's a model to fit every need and every purse. This type of machine adds and lists items on a narrow paper roll.

seems to have been largely an outgrowth of attempts to fill a need suggested by the first type, with the result that the rapid development of both types was contingent one upon the other. Even so, it appears both feasible and advisable to give an outline of the historical background of the two distinct types separately, which method of presentation has been followed in this book. Therefore, in this chapter we shall trace the development of adding-listing machines, and in the chapter on Calculating Machines the development of the non-recording calculating machines.

EARLY EFFORTS TO PERFECT AN ADDING-LISTING MACHINE

The art of recording columns of figures and automatically adding them as an incident to recording is old in principle, but not in practice. Many attempts to perfect a machine that would record legibly and at the same time add the figures recorded under all conditions were made long before any one finally succeeded in constructing a practical model. E. D. Barbour in 1872 secured the first patent covering a machine designed for arithmetical recording.

Two other attempts which are recorded were made by an American, Frank S. Baldwin, in 1875, and a Frenchman, Henri Pottin, in 1883. Just two years later, on January 10, 1885, William Seward Burroughs applied for a patent¹ on a machine which recorded the final results only. Later he applied for a second patent which recorded the individual items in addition to the total. Both patents were granted August 21, 1888. In the same year an adding and writing machine was patented by A. C. Ludlum.

Among the list of patents covering recognized practical recorders which were actually manufactured and sold, we find that a patent for an adding-listing machine was applied for by Dorr E. Felt on January 19, 1888.

¹Number 388,116.

LATER IMPROVEMENTS

Within the next few years numerous improvement patents were filed. Out of the number stand several of importance. One patent¹ issued to Burroughs in 1893 covered three new features. By means of a special key any incorrect set-up of keys could be released; by means of another key repeated adding was made possible, thus introducing machine multiplying. The third feature permitted the printing of a sub-total without clearing the machine.

Records of the adding-machine patents as they were applied for and issued show a steady development towards the present-day adding machine. One patent followed another in close succession in the early twentieth century; only a brief outline according to chronological order can be given here.

According to records, Frank C. Rinche filed the first application in 1901 for a patent² covering an electric motor-driven adding-listing machine. Later, a number of patents were issued to him on combinations of the electric drive.

Two other important features were patented by Dorr E. Felt. On October 21, 1902, he was granted a patent³ on a device which made cross-tabulating possible. By means of this mechanism, horizontal adding and recording could be accomplished as well as vertical. On January 17, 1905, Felt obtained a patent⁴ on a lock mechanism which automatically shifted to a new column when a predetermined number of items had been printed.

In 1904 H. C. Peters conceived the idea of an automatic non-adding mechanism in cross-tabulating and applied for a patent for this invention shown on a Burroughs adding-listing machine. On June 4, 1912, he was granted the patent.⁵

¹Number 504,963.

²Number 726,903.

³Number 711,407.

⁴Number 780,272.

⁵Number 1,028,133

The electric drive raised the problem of speed as the construction of the adding and listing machine necessitates a certain amount of time for "cranking" the motor. This lost time could be eliminated if the machine were provided with what is known as an "early key release," permitting the operator to set up the next amount before the machine has completed its cycle. A patent¹ for such a device adapted to a Pike machine was applied for by McFarland on October 19, 1905.

On June 12, 1906, A. Macaulay received the first patent² on a symbol-printing device. By means of letters, stars, and other characters, totals, subtotals, dates, and abbreviated matter can be indicated, and thus a complete system of signaling may easily be worked out.

Records show that in the same year—July 3, 1906—a patent³ was issued to C. W. Gooch. This patent introduced what is now known as the split keyboard. It provided a means of eliminating the printing of ciphers in all other columns to the right of any key depressed, at the same time permitting the printing of items and the accumulating in each column.

One year later, May 14, 1907, a flexible or self-correcting keyboard was patented⁴ by Felt and Wetmore. By this invention, mistakes in depressing keys can be rectified instantly, simply by depressing the correct key or keys. Previous to this invention a flexible keyboard had been patented by Edward Selling, who received foreign patents in the year 1886.

In 1908 a grand totalizer was patented⁵ by William E. Swalm. By means of his invention the sum of all totals of the footed columns could be printed. The method of subtraction

¹Number 895,664.

²Number 823,474.

³Number 825,205.

⁴Number 853,543.

⁵Number 885,202.

was improved also by William E. Swalm in 1910, when he obtained his patent¹ showing on a Burroughs machine how subtraction could be obtained by setting up the number to be subtracted. This direct method was a great improvement over the old building-up or complementary method which had been used by all machines previous to this time.

It was in 1912 that Jess G. Vincent was issued a patent² on a non-add symbol printer. A year later, a device known as a shuttle carriage came into existence, applied to the Pike adding-listing machine and patented³ on February 11, 1913, by Clyde E. Gardner. This device made it possible to print alternately by means of a shifting carriage.

A device which facilitated the insertion and removal of paper was patented⁴ on a Burroughs adding-listing machine by F. C. Rinche on December 12, 1916. This is known as an "injector" and "ejector."

Improvement of the split keyboard was attained by Fred A. Nieman when two patents were issued to him for two devices which were applied to the Felt "Comptograph." One patent,⁵ granted July 5, 1919, covered a device which made it possible for the operator to select and split the keyboard into any combination desired, thereby greatly increasing the usefulness of the machine. The other invention, patented a year later, made possible the elimination of printing of certain columns in tabulating and vertical printing.

Most of the improvements named, however, are of such a nature that the broad feature disclosed is adaptable to all makes with equal results, provided mechanism should be specially designed to suit such machines. Now, before getting into the classification of adding-listing machines, it seems advisable to point out certain general character-

¹Number 1,028,149.

²Number 1,043,883.

³Number 1,052,911.

⁴Number 1,208,375.

⁵Number 1,309,692.

istics that determine the application and value of adding machines. Each type of machine has certain specific features, and, in order that the reader may weigh the pros and cons, so as to determine which is the best type of equipment for his particular use, we shall first outline the more general characteristics which the prospective user should take into consideration.



Figure 4: This model, of the full-, high-keyboard variety, is a straight adding machine—that is, it lists and accumulates the items and prints a single total as told on page 74. Similar in appearance are duplex machines, described on page 76, which give two separate totals. The total amounts accumulated are always visible on the dials below the keyboard.

CONSIDER THESE POINTS BEFORE BUYING

Simplicity of operation is an important item to the prospective user. All adding machines are operated in substantially the same way; that is to say, the amount is set up on the keyboard and then the handle or motor operated



Figure 5: A machine typical of the full-, high-keyboard class, described on page 74, is illustrated above. Some models of this style are equipped with split devices. Note that this machine is electrically operated, also note the wide carriage which provides for statement sheets.

to transfer the amount from the keyboard into the machine. However, in performing more or less complicated calculations the procedure is not always the same on different machines. And because what is simplicity of operation to one buyer is not simple to the other, it is well that the man who is contemplating the purchase of an adding-listing machine have fully demonstrated to him the process of performing such tasks as the machine he buys must do for him. It goes without saying that he should endeavor to select the machine which can do his work best.

The application of the machine to the business is also highly important. Further, the application of the machine to the work of a specific department or operation cannot be overlooked. Not every type of adding-listing machine can perform the same task with equal efficiency and econ-



Figure 6: The low-keyboard style is equipped with the usual feature keys; in fact, the chief difference between the low and the high keyboard is that of visibility of the detail strip. For further details, turn to page 75.

omy. There is a particular type of machine better suited to certain figuring work than any other. For instance, a hotel steward finds that among the various styles there is one adding machine which fits his needs more perfectly than any other. On the other hand, the machine most practical for him will perhaps not be suited to the more intricate forms of figuring work—such as distribution of sales and costs—as will the machine especially designed for that kind of calculation. Obviously, it is wasteful to buy one machine when another will handle the work better.

Of all the elements which enter into a proper selection, perhaps no other is more essential than the careful con-

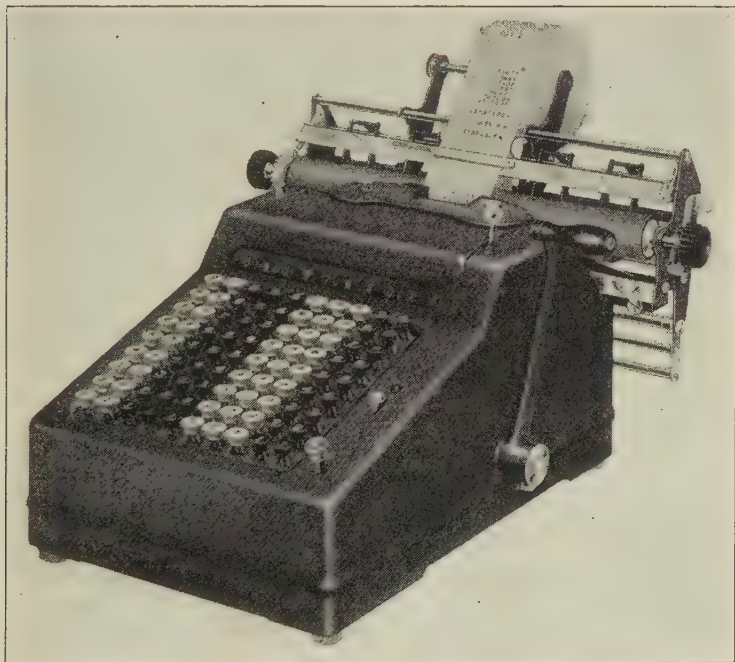


Figure 7: Here is a low-keyboard style adding machine. Note that it is also of the full-keyboard style with right-hand control. When this type machine is used, the items are visible as they are set up on the keyboard and as they are printed on the detail strip.

sideration of application as it relates to efficiency, all of which should make this subject of pertinent interest to the prospective user.

Then, too, the character of mechanical service rendered by the manufacturer has a direct bearing upon the proper selection of an adding-listing machine. While some classes of work require a highly complicated machine for their performance, others can be performed with a less complicated one. And naturally, the very complicated machine requires more service than do the simpler models. That mechanical service—with the resulting costs—is closely allied with the proper selection of a machine on the basis of application, is apparent.

Some manufacturers maintain service centers where mechanically trained experts, who not only understand adding machines and their application to business, but also have had a thorough knowledge of better business methods, are at the call of users. They are prepared to give users quick service on their equipment, whether they wish a ribbon changed or a machine rebuilt. Other companies have experimental departments which build special machines for intricate figure work of an unusual nature to which the ready-made machines are not so well adapted.

With such an assortment of conditions to face, it is evident that the prospective user has a really difficult problem to solve when it comes to selecting the right machine. Realizing this, it now seems pertinent to break up the subject of adding-listing machines into its several divisions, for the further guidance of the reader. But since this classification depends to a certain extent upon the principles of operation, let us first cover this point.

PRINCIPLES OF OPERATION

In adding machines addition is accomplished by putting amounts into the machine in the manner required by its particular construction. The ordinary method of subtrac-

tion is by the use of "complementary" numbers. In some instances the complements are indicated in small figures on the keys.

Manufacturers have perfected direct-subtracting machines and very soon the complementary method will be entirely displaced by the direct method. At the present time there are on the market several machines which perform subtraction by the direct method. The amount to be subtracted is set up on the keyboard in the same manner as for addition, and depression of a special key or lever causes that amount to be subtracted. Adding machines equipped for bookkeeping work (Chapter VIII) perform subtraction directly.



Figure 8: Each key of the ten-key adding machine, whose construction and operation are explained on page 76, represents a digit. Some models perform subtraction by the complementary method; others subtract directly. This machine may be had in column capacities ranging from six to thirteen.

The principle of multiplication is simply the addition of an amount as many times as that amount is to be multiplied.

The principle of division is that the divisor is repeatedly subtracted from the dividend as many times as it is contained in that dividend. The number of subtractions made is automatically registered upon counting wheels as the quotient.

Those four basic principles are at the bottom of the operation of all modern adding machines.

Generally speaking, all adding machines can be said to be power-driven—that is, the machine can be operated by pulling the handle, or by depressing the motor contact or touch bar which controls the electric motor. To operate these machines it is necessary to depress the keys which represent the amount to be put into the machine. Following the depression of the keys, the handle is pulled (if it is a hand-operated machine) or the motor contact or touch bar is depressed (if it is an electrically operated machine) and the amount is added to the figures already accumulated in the machine; at the same time, this amount is printed on the roll paper or wide sheet which is in the carriage of the machine. With full-keyboard machines nothing is recorded until the handle or bar is operated, thus allowing a correction to be made before it is recorded in the machine. When a total is required, the total key is depressed and the machine prints the total and clears the wheels.

ADDING MACHINES DIVIDED INTO THREE GROUPS

For the purposes of this book, adding machines may be classified as follows:

First, *straight adding machines*, which may be further broken down into two classes—the full or standard keyboard, and ten-key machines (see Figure 1).

Second, *duplex machines*, which may be further subdivided into two types—the full, and the ten-key duplex.

Third, *adding and subtracting machines*, which are also of two kinds—full and ten-key.¹

A machine which does not fall into any of these classes is one with a pull-down lever keyboard, there being a lever for each column. As the levers are operated in the slots, the amounts thus set up accumulate in the dials² (see Figure 2).

Another type of machine that cannot be placed in our classification is the vest-pocket, which is, as its name implies, a very small adding machine. Figures are arranged in columns, so that by inserting a metal pencil device called a stylus in any desired position, the amount appears in the total position.³

Still another type of adding mechanism,⁴ which is automatic in that nines and tens are carried from one column to another, is in use. This type differs from the so-called vest-pocket variety due to the automatic feature.

In the full-keyboard, straight adding—listing machine division there are two types of machines, generally known as the high-keyboard machine and the low-keyboard machine, commonly referred to as the visible keyboard. In the full-keyboard duplex class there are both high- and low-keyboard machines (compare Figures 3 and 4).

FEATURES COMMON TO ALL

Before going farther into the classification and description of adding machines, an explanation of some of their common characteristics seems advisable.

First, in addition to the numeral keys, certain feature keys are found on all machines. Not every machine is equipped

¹Further description of adding and subtracting machines will be found in Chapter VIII, which is devoted to bookkeeping machines.

²This machine is manufactured by such companies as The Todd Company.

³Machines of this type are manufactured by such companies as Erie Calculator Company, and Pocket Adding Machine Company.

⁴Manufactured by such companies as Automatic Adding Machine Company, and The Calculator Company.

with all of them, but, in variation, they are standard equipment of practically all machines on the market.

Total key. Depression of this key causes a total to be printed and clears the machine.

Subtotal key. The subtotal key makes it possible to obtain a subtotal. Depression of this special key gives the subtotal without clearing the machine, and this makes it possible to continue adding and to obtain a grand total.

General error key. The general error key is used to restore to normal all keys that have been depressed.

Repeat key. Used principally in multiplication. It locks down keys which have been depressed so that when the machine is operated again the amount will be re-added into the machine.

Separate column release key. Mounted one under each column or one over each column. The release key corrects incorrect depression of a key in a particular column. (Note: ten-key machines do not have this feature.)

Non-add key. When it is desired to print an item that is not to be added, this key is used. For instance, numerals representing dates and folio numbers are printed but not added.

Non-print key. The non-print key provides for the adding of an item which is not to be printed.

Split feature. This feature is the means for splitting the printing mechanism into two or more sections so that several columns may be listed and added at the same time, and the total of one or more columns printed.

Most machines print in two colors—black for items and red for totals, subtotals, and non-add items. Symbols are generally used.

It is common practice on most all machines to print symbols indicating total, subtotal, non-add items, and to show

by a clear symbol that the machine is clear before another column is listed.

The carriage, obviously, is that part of the machine which holds the paper on which printed records are made. *Narrow* carriages are designed to take narrow rolled paper and are usually fixed in one position. *Wide* carriages take wide sheets, statements, and other kinds of forms and usually move from side to side. *Tabulating carriages* are provided with means to regulate the column positions of items. Some models tabulate by means of a key or lever, and others automatically by controls on the machine after the items are printed and the carriage returns automatically to its initial columnar position.

STRAIGHT ADDING MACHINES

A straight adding machine is one which lists and accumu-

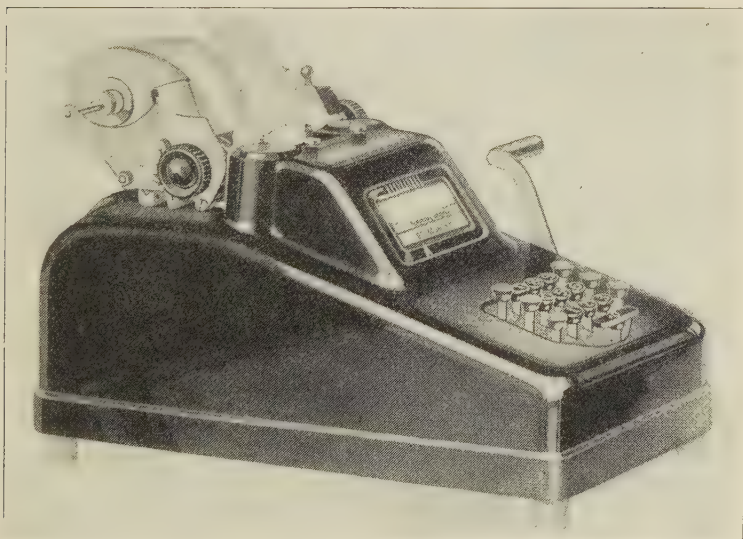


Figure 9: The two machines illustrated by Figures 8 and 9 represent the two styles of ten-key keyboards. Note that the keyboard shown in Figure 8 has two rows of five keys each, while the one pictured above has three rows of three keys each with the touch bar below. Turn to page 76 for further description of this type of machine.

lates the items added and prints a *single total* as distinguished from the duplex machine, which is equipped with two adding counters and gives two separate totals or a total for each of any number of groups of figures, automatically furnishing a grand total without having to relist a single item.

Full-Keyboard Type. As stated above, straight adding machines are of two kinds, full-keyboard and ten-key. The full-keyboard type is further divided into high- and low-keyboard machines. The difference between the two is that the items are not visible as printed on the high-keyboard machine unless the carriage is swung back to reveal them; whereas, on the low-keyboard machine, the printing point is visible.

We shall first consider, then, the straight high-keyboard adding machine with a full keyboard, designed for adding and listing. Models of this variety of adding machines are reproduced in Figures 4 and 5, on pages 64 and 65, respectively.

First, in regard to visibility: The set-up is visible to the operator on the keyboard before he puts the amount into the machine; the total of amounts accumulated is visible on the total dials below the keyboard; the printing point is not visible unless the carriage swings back to reveal it.

As may be seen from the diagram of a full keyboard (illustration A of Figure 1, on page 57), a separate key is provided for each numeral up to the capacity of the machine, which in this case is 999,999,999. Models may be had with from 7- to 17-column capacities. The keyboard of this kind of adding machine is equipped with additional keys, such as, for instance, total, subtotal, non-add, error, repeat, and separate column release keys. Shuttle, automatic or semiautomatic, cross-tabulating carriages may be had for this class of machines.

From the illustrations in Figures 4 and 5 it can be seen that this machine is large and comparatively heavy, and that

it is fixed to a stand which may be moved from place to place.¹

Figures 6 and 7 show two models of the low-keyboard style.² This type of machine is much lighter than that just described, some weighing as little as 15 pounds.

The keyboard does not vary from that of the high-keyboard machine and is equipped with the usual feature keys. Statement models print month and date. Column capacities vary from 5 to 11. Carriages are either wide for statement sheets or narrow to hold paper rolls. Some makes have small complementary numbers on the numeral keys for performing subtraction;³ other models subtract by the direct method.⁴

The items are visible as they are set up on the keyboard before the operator pulls the handle or depresses the electric operating bar; after being added to amounts previously put into the machine, they are visible on the printed sheet; the total amount accumulated is visible in the total dials located either above or below the keyboard.

Split and normal devices can be had for some models; machines are either hand or electrically operated. Operation consists of depressing the keys for the proper amounts and then putting the amount into the machine by operating the handle or motor bar. Depressing the total key and operating the machine causes a total to be printed. Some machines require that the operator take a "spacing" stroke before depressing a total or subtotal key.

¹High-keyboard machines are manufactured by such companies as the Burroughs Adding Machine Company.

²This type of machine is manufactured by such companies as Add-Index Corporation; Burroughs Adding Machine Company; Federal Adding Machines, Incorporated; Lanston Monotype Machine Company; Peters-Morse Manufacturing Company; Portable Adding Machine Company; Victor Adding Machine Company; and Wales Adding Machine Company.

³Machines of this type are manufactured by such companies as the Add-Index Corporation; Burroughs Adding Machine Company; Lanston Monotype Machine Company; Peters-Morse Manufacturing Corporation; and Victor Adding Machine Company.

⁴Such companies as the Burroughs Adding Machine Company and Peters-Morse Manufacturing Corporation make machines of this type.

*Ten-Key Type.*¹ Each key of the ten-key machine (see Figures 8 and 9) represents a digit, and the designation of the key for the item causes progressive columnar positions automatically. For instance, if it is wished to set up the number 420, the operator depresses the 4, then the 2, and then the 0 in the regular order in which the figures are read, the mechanism automatically taking care of the numerical or columnar order. The items are visible as they are printed. The keys are arranged in two and three rows with the feature keys at each side.

Addition is accomplished by depressing the keys for the amount and then operating the handle or motor contact or touch bar.

Some models perform subtraction by the complementary method, there being small numbers on the numeral keys; others subtract by the direct method.²

Models may be had in from 6- to 13-column capacities. Some have split devices for taking care of more than one column of figures.

The machines have devices for printing the name of the month, and such characters as Bal., Dr., Cr., and the like.

The smallest machines of this class—those with the smallest column capacity—weigh about 30 pounds. Carriages may be either wide or narrow.

DUPLEX MACHINES

As its name implies, the duplex machine has two sets of adding dials and carries two totals simultaneously.

Individual totals are accumulated in one counter and a grand total in the other. There are duplex machines with full keyboards—low and high—and ten-key duplex ma-

¹Such companies as the Dalton Adding Machine Company; Federal Adding Machines, Incorporated; and Sundstrand Adding Machine Company make straight adding machines with ten keys.

²Machines of both types are manufactured by such companies as the Dalton Adding Machine Company; Federal Adding Machines, Incorporated; and Sundstrand Adding Machine Company.

chines. This class of machines is especially adapted for cross-footing and all work requiring totals of individual groups and a grand total at the same time.

Full-Keyboard Type. A machine of this class with a high keyboard is identical in appearance with the straight adding-listing machine with a high keyboard. It is equipped with two counters, the upper and lower, as they are called. A lever automatically throws either one into accumulating position. Both counters cannot be active at the same time. A total can be transferred to the other counter to make a grand total. As the amount is transferred to the lower counter, the upper counter is cleared. By this means, the items of individual groups may be totaled in the upper counter and then transferred to the lower counter to be added into the grand total for all groups.¹

As items are registered in the first counter of the low-keyboard duplex they are automatically accumulated into the second counter, both being in position at the same time. Individual totals, only, may be accumulated in the first counter, and as the total is taken, the second counter moves out of position and does not record until a grand total of all the individual totals is taken.²

Except for the two counters, this type of machine is like the straight adding machine with a low keyboard. (See Figure 10.)

*Ten-Key Type.*³ Now we come to the consideration of duplex machines with ten keys. One such model adds two sets of figures either in the same or in separate columns; it adds and subtracts simultaneously in a single operation, subtracts directly, and performs multiplication in multiplex,

¹Such companies as The Burroughs Adding Machine Company make machines of this type.

²Machines of this type are made by such companies as the Wales Adding Machine Company.

³This type of machine is made by such companies as The Dalton Adding Machine Company; Federal Adding Machines, Incorporated; and Sundstrand Adding Machine Company.

that is, two or more multiplications involving different factors can be made at the same operation. Thus many multiplications by as many different multipliers can be made, and a total of each separate multiplication and a grand total of each printed.

In another type of duplex machine with ten keys the amounts added in the separate accumulators are immediately printed visibly. Items printed in one accumulator



Figure 10: Here is a hand-operated machine of the low-keyboard duplex type. As the items are registered in the first counter of the low-keyboard type, they are automatically accumulated into the second counter, both being in position at the same time.

are indicated by a "C"; items in the other are printed without a symbol. The totals of "C" items appear printed with the same designation; the total of the other items is printed with the standard or regular total symbol.

The type of work done by the multiple and ten-key duplex machines is not the same, and the prospective owner should look thoroughly into this matter in order to know which type will perform his particular kind of work most efficiently.

CUTTING CORNERS IN FIGURING

In the future, it is safe to say, the history of accounting will be the history of adding and calculating machines. For these machines are today the chief factor in the development of better bookkeeping practice. Their greatest service lies in giving the world a way of controlling business by figures. Adding and calculating machines are not only adapted to current bookkeeping practice, but they are teaching men the value of business records.

The success of many concerns is due in part to the figure records which show where the profits and losses are occurring. Such a vast amount of figuring can be obtained only by the employment of the adding machine, which insures speed, efficiency, and accuracy.

The idea that the adding machine justifies the outlay of capital only in concerns which have long, intricate problems together with a great mass of daily figure work, has been exploded.

No matter how little figuring is needed in the day's business or how simple the operations, the modern business man is finding out that his office equipment is incomplete without a machine for this end of the work.

Even a cursory examination of the capabilities of these machines reveals the enormous scope of the work which they can do. In every line of business and in every department they save time and money and give the assurance of accuracy.

For example, a plumber when figuring a bid saves valuable time if he has an adding machine at his elbow; more complicated calculations, such as auditing and preparing monthly statements or taking periodical inventories, are stupendous tasks when they are attempted without the aid of machinery.

It is by answering every need for a figuring device that the adding machine has made for itself an indisputable place among office tools.

An adding machine is usually bought for certain definite work—mostly straight adding and subtracting. But as the user becomes familiar with the device, he finds many other tasks which it can perform. Listed below are a number of uses which show the wide-spread adaptability of the machine.

DAILY USES

1. Proving daily postings
2. Daily ledger balance
3. Daily cash balance
4. Preparing deposit slip in duplicate
5. Daily recapitulation of sales—cash, credit, and so forth
6. Checking invoices and freight bills
7. Figuring discounts
8. Computing commissions
9. Summary of day's receipts and disbursements
10. Figuring estimates
11. Listing and adding yardage, feet, or weight of goods packed, received, or shipped
12. Listing and adding hours and minutes, tons and hundredweights, feet, inches, fractions of inches, and other compound numbers
13. Posting perpetual-inventory records

Certain definite figuring must be done weekly. In the busy office, accomplished by human effort this work becomes plain drudgery. Thousands of business men all over the country are easing this burden of figuring with the adding machine.

WEEKLY USES

14. Preparing weekly pay-roll
15. Making out pay envelopes
16. Preparing weekly summaries of labor distributions
17. Making weekly summaries of sales by departments, by salesmen, by territories, by ledgers, by commodities, or by any desired division
18. Analysis of accounts receivable
19. Analysis of accounts payable
20. Handling petty cash expenditures
21. Compiling change sheet for pay-roll
22. Comparative statements of operating expense and earnings
23. Proving travelers' expense reports

Monthly tasks grow quite as irksome and consume too much time. Again the adding machine solves the problem.

MONTHLY USES

24. Taking off trial-balance figures, debits, and credits
25. Footing ledger accounts preparatory to taking off trial balance
26. Reconciling cash-book balance with bank balance, listing number and amount of each outstanding check
27. Making monthly customers' statements, giving months, date, total of debits, total of credits, and balance due
28. Monthly summaries of merchandise, sales, and profits
29. Recapitulation of accounts receivable and payable for controlling accounts
30. Analysis of accounts receivable and payable
31. Compiling statement of production cost
32. Compiling statement of material and supplies used

At the end of the year the business man wants to know what progress his concern has made, and figures tell the tale. Adding machines bear the burden of the labor it takes to get these and other figures together.

ANNUAL USES

33. Footing inventories, calculating extensions
34. Compiling statement of profit and loss for year
35. Preparing balance-sheet
36. Making comparative and general statistical statement to show progress made by business

VI

CALCULATING MACHINES

Why pad-and-pencil figuring is costly. An adding machine or a calculating machine? Ancestors of the modern calculator. How to select a calculating machine. Two types from which to choose. Key-driven calculators. Crank-operated calculators: key-set machines; lever-set machines. You can use a calculating machine in every department of your business.

ALL day long, the world over, armies of clerks figure invoices, check and prove sales-slips, prepare cost figures, make estimates, figure pay-rolls. This endless adding, subtracting, multiplying, and dividing is at the bottom of statistical information which enables busy executives to keep their fingers on every pulse beat of their organizations. When accomplished by slow, brain-fagging, pad-and-pencil methods, this fundamental figuring consumes more time and money than all other computations made in business. Not only is the work slow and costly, it is often inaccurate as well.

Very different, however, are the results when all this figuring is done by machine. Then, speed, economy, and greater accounting efficiency are secured. The calculating machine takes all the hard work out of figuring by assuring mechanical accuracy, and the executive who has delegated to this machine the task of doing the figure work which the machine is designed to handle can rest assured that the results are correct and that figure details are handled most economically. Calculating machines today have become indispensable in many thousands of offices.

With a calculating machine, cost figures may be carried to the fourth, fifth, sixth, or eighth decimal; engineering data computed to a certainty; the most exact mathemati-

cal operation performed with lightning-like rapidity; complicated problems, such, for example, as reducing quantities of grain, expressed in pounds, to bushels, and computing the value at a given price per bushel, are no longer formidable. In figuring pay-rolls the machine is particularly efficient. When a number of men are working a varying number of hours, at different rates per hour, it is possible, with the use of a calculating machine, to ascertain rapidly the exact amount due each worker.

Toward the end of this chapter more will be said of uses to which the calculating machine may be put. Here, it is only necessary to say that, whatever your business, the calculating machine will save time, money, and energy; prevent delays, mistakes, and discords.

"But, will not an adding machine do that?" the reader may ask. To answer his question we must remind him that, at the beginning of the chapter on adding machines,¹ an arbitrary distinction was made between figuring machines that would list the items added and those which would not. The former are grouped together under the heading "Adding Machines." The latter are classified as calculating machines.

AN ADDING MACHINE OR A CALCULATING MACHINE?

The fact that all four arithmetical operations—addition, subtraction, multiplication, and division—can be performed on the adding-listing machine and on the non-listing or calculating machine makes it difficult for the average person to distinguish between the two types of machines. Furthermore, it arouses the question of difference in construction and uses of the machines. Broadly speaking, it may be stated that, while all four operations are possible on either type, the difference in uses rests:

¹See Chapter V.



Figure 11: Interesting family resemblances are apparent when the early model shown above and those in Figures 12 and 13 are compared with present day machines. Here is illustrated one of the first key-driven calculators in actual service. Depressible keys cause the rotation of numeral wheels and the answer appears in the dials. See page 88.

First, upon the relative importance of preserving lists that will serve as records;

Second, upon the relative importance of speed with which the figuring work must be performed.

Keeping these facts in mind, the prospective user will have no trouble in choosing wisely. He must decide, of course, which is the more valuable for his purpose: a record, or rapid results. He should consider, too, the variety of work which his figuring machine must do. It is not the purpose of this book to attempt to suggest which type should be selected, but merely to caution the prospective user to make

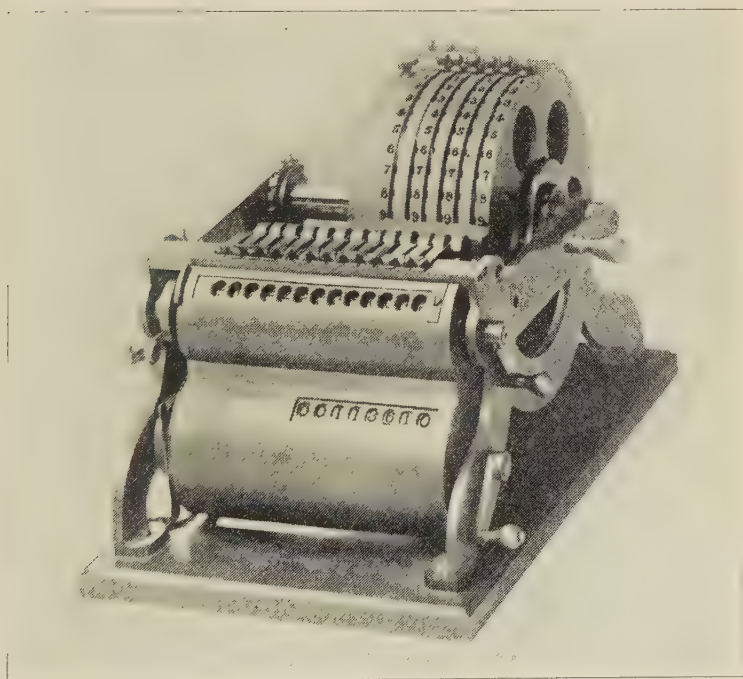


Figure 12: This machine, patented in 1875, was a forerunner of the lever-set calculator. A set-up was made by pulling levers to the desired numbers. A revolution of the drum in one direction caused amounts to be added; a revolution in the opposite direction accomplished subtraction. For a more detailed description, read page 88.

a survey of his work before deciding whether an adding-listing machine or a calculating machine is best suited. Then, after he has decided on one or the other, he will have to select a machine from among a number of makes. Points on which his choice should be based will be touched upon later, after the development of the calculating machine has been sketched briefly.

Although the general history of all figuring machines was covered in another chapter, there are certain points in the evolution of the non-listing (calculating) machine which should be mentioned.

ANCESTORS OF THE MODERN CALCULATOR

Although the history of figuring machines reveals that the development of calculating machines has extended over a period of several centuries, the commercial use of calculating machines is comparatively recent, in that it dates from the year 1820, when Charles Xavier Thomas constructed his famous Arithmometer. It is interesting to note that these early models were multiple-order machines equipped with turnstiles instead of the well-known depressible keys of the modern calculators. In comparison with the modern rapid calculator they were very slow. However, like Pascal's machine, invented in 1642, they were capable of adding a number of columns or items of 6 to 8 places at one time.

While the turnstile machines had their early development in foreign countries, it was in this country that the first attempt was made to construct a key-driven calculator. Records show that on February 5, 1850, a patent¹ was granted D. D. Parmelee on a device upon which could be added a column of figures by means of depressing keys corresponding to the digits. The sum or total could be read from the lowest number on the numeral bar. This long ratchet-toothed bar had a flat surface which was numbered

¹Number 7,074.

consecutively from top to bottom, and thus replaced the numeral wheels which had been used previously. On this plan, only one column of figures could be added at a time, for it was necessary to add the units first, note the total, then clear the machine before the tens figures of the total could be added or carried over to the tens column as in mental addition.

Numerous patents following in general this principle were granted, but because of their lack of means to make several columns of key-driven mechanism operable they were impractical. The idea, however, was of great value to the development of the calculator. Following this step many attempts were made to produce a practical multiple-order, key-driven machine. Dorr E. Felt finally solved the problem by devising a mechanism which permitted the carrying of

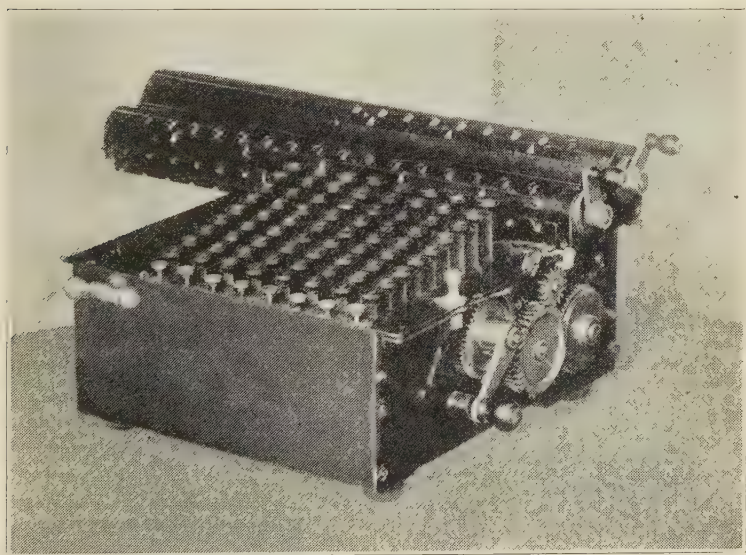


Figure 13: Another type of calculator is the key-set, crank-operated machine described on page 89. Here is an early model built on that principle. Like present-day machines of this class it had a full keyboard, a movable carriage containing two sets of dials, and a crank which turned the amount into the machine.

tens between multiple-order driven columns. His first model, patented October 11, 1887,¹ was characterized by depressible keys which caused the rotation of numeral wheels and by dials through which the answer was visible below the keyboard (see Figure 11). Records show that two patents² which were issued to Felt contained several features found on his present-day machine. In June, 1909, another machine of the key-driven type—the Burroughs calculator—was patented.³

In Europe, under the Odhner patents the lever-set principle was employed. The design of these machines, however, was practically the same as that of the calculator previously patented in 1875⁴ by Frank S. Baldwin in the United States. (See Figure 12.) A calculator built on this same principle was patented later in 1911 by R. H. Marchant.⁵ In the same year a patent was granted to Baldwin,⁶ who had obtained several patents since his basic patent of 1875.

The operation of machines of this type was accomplished by means of pulling levers or knobs in order to set up the desired number. Addition, subtraction, multiplication, and division were accomplished by means of revolving drums. For addition they revolved in one direction, and for subtraction the direction was reversed. For multiplication the revolutions were repeated in the same direction as for addition, and for division they were repeated in the same direction as for subtraction.

Two sets of dials provided a means of reading totals. In one the accumulation of totals appeared; in the other, there

¹Number 371,496

²Numbers 762,520 and 762,521.

³Number 926,151

⁴Number 159,244

⁵He founded the Marchant Calculating Machine Company and in 1919 set out to develop a keyboard machine which was placed on the market two years later.

⁶Later Mr. Baldwin became associated with J. R. Monroe. Machines have been developed and marketed since under the name of Monroe Calculating Machine Company.

appeared the figure which was added, subtracted, multiplied, or divided.

As the modern calculating machine developed, the trend on certain kinds of work has been toward the key-set type of machine which has a keyboard like that of the modern adding-listing machine of the full-keyboard type, a movable carriage containing two sets of recording dials, and a crank which turns the amount into the machine in the manner of adding-listing machines (see Figure 13).

This brings the history of the calculating machine up to its present high degree of development. It is altogether reasonable to suppose that as time goes on improvements will be found for machines which now seem to answer all demands for efficient figuring.

HOW TO SELECT A CALCULATING MACHINE

Before passing to the present-day machines, it may be well to suggest some of the fundamental points to be considered when selecting a machine. It is not the purpose of this book to touch upon the comparative usefulness of the different types of equipment; the purpose is to acquaint the prospective buyer with these various types, and to set forth the salient points to be considered in selection so that he may more intelligently approach the problem of purchasing the machine best suited to his needs.

He should first analyze his figure work to find out the relative amount spent on the four branches of arithmetic, and then test out the various types to determine which is best adapted to the largest percentage of his work. Without this information his selection will be largely guesswork. In examining the various types, the business man should find out whether the operation is simple or complicated, how fast the machines can work, how many kinds of figure work they can do, how durable they are, the kind of service rendered by the manufacturer, and lastly, the relative cost.

The process of arriving at answers to problems in addition,

subtraction, multiplication, and division varies in the different types of machines. Then, too, some machines require more skill in operation than others, and the prospective owner should not overlook these points in selecting a machine. His choice should also depend upon whether the machine is to be used by all the clerks in the office or, at all times, by one skilled operator. Naturally, a clerk who uses the machine only part time cannot obtain the same value from it as a full-time skilled operator, especially where accuracy and speed are dependent largely upon the operator.

Speed is one of the most important considerations in the selection of a figuring machine of any sort. The construction of some machines allows greater speed than others, and the purchaser should bear this in mind.

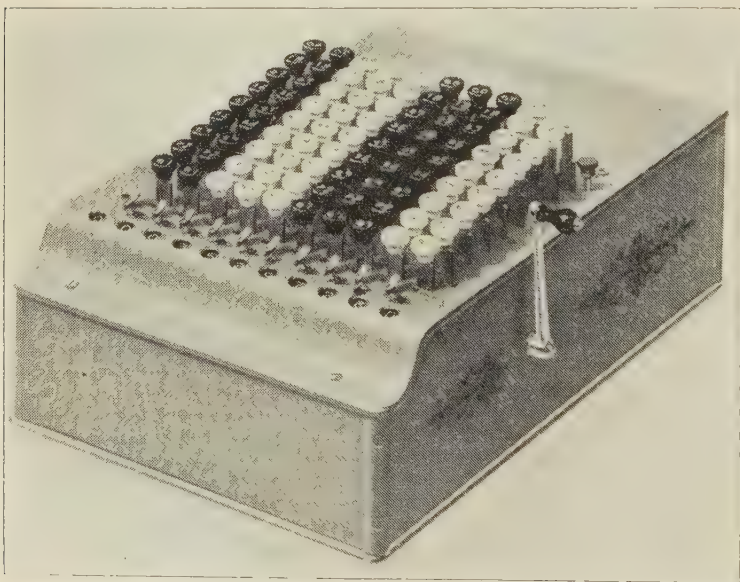


Figure 14: The several types of calculating machines on the market offer the prospective buyer an opportunity of installing one particularly fitted to his figuring needs. Addition is accomplished by the one motion of depressing the keys of the direct key-driven machines. A typical model is shown above. This class of calculators is considered on page 94.

If a man has several kinds of figuring work to do, he will be interested in finding out if the machines under consideration can efficiently perform them all. Perhaps he has to figure intricate engineering formulas; perhaps more simple figuring, like the balancing of debits and credits, is part of his daily calculation; in other words, he should be assured that the machine he buys can be adapted to his varying needs.

The purchaser should also know how a machine will stand up under continued hard usage. Some machines are so constructed that they may be expanded to keep pace with growing requirements.



Figure 15: The theoretical principles involved in the key-driven type of calculating machine are that multiplication and division are performed as variations of addition and subtraction. Key-driven machines for handling fractions, hours and minutes, pounds and bushels, sterling and other kinds of currency are also manufactured. See page 94.

Calculating-machine service does not usually end with the sale. Most companies render service in the form of analysis of figure work, instruction of clerks, the supply of trained operators, correspondence courses in instruction, and a number of other aids to the user. The type of service must not be overlooked.

Finally the cost of the equipment must be considered. This will depend somewhat on the size of machine required for the prospective purchaser's figuring work. There is a machine for every business, large or small, and for every-size bank-roll.

Having found out these six essential facts, the prospective owner is ready to weigh the characteristics of one type

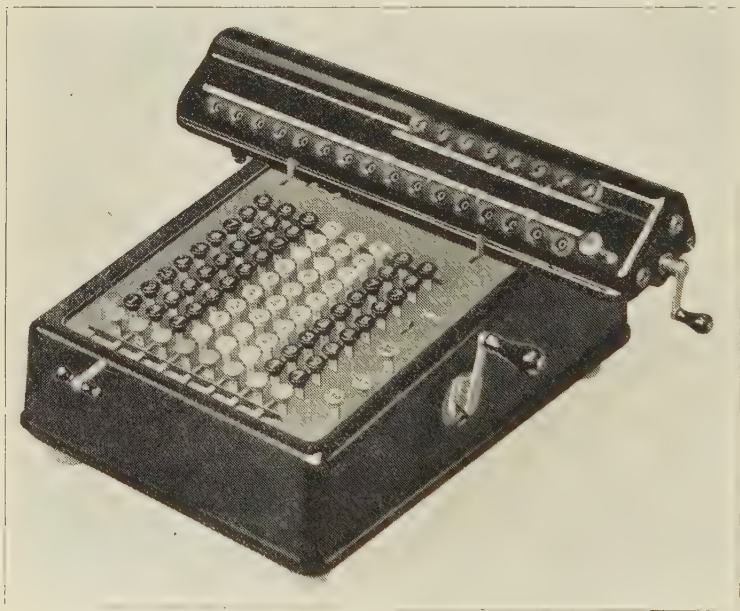


Figure 16: To operate the key-set type of calculating machine the numbers are first set upon the keyboard and the amount turned into the machine by operation of the crank or, if motor-driven, by pressure on the touch bar

Figures 17 and 18 picture other machines of this class. See page 95.

against those of another and decide which, for his use, is the most economical and serviceable machine.

TWO TYPES FROM WHICH TO CHOOSE

To prepare the reader for a more intelligent examination of the various machines offered him, a classification of all such devices seems necessary. A general description of each type will follow.

There are two kinds of calculators: the key-driven and the crank-operated. The crank-operated type may be subdivided into key-set and lever-set machines. When the keys of the direct key-driven machine are depressed, the value of the keys is added, the total appearing immediately in the dials. The crank-operated machine provides for the setting

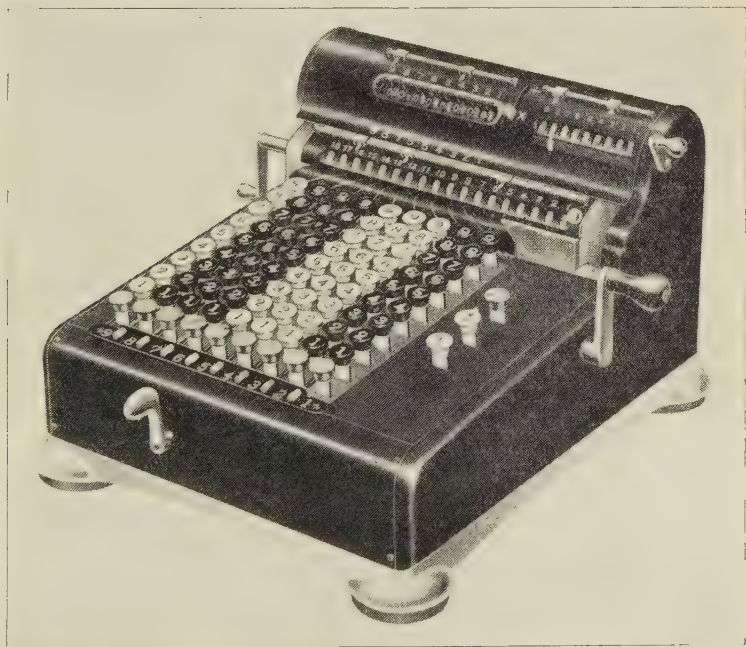


Figure 17: Above is shown another key-set type of calculating machine. Figures 16, 17, and 18 are typical of the key-set or crank-operated type.



Figure 18: The key-set calculator above is constructed with two keyboards—the full keyboard to the left and a special multiplying keyboard to the right. These special keys may be used also for division. A set of dials is provided from which the accuracy of calculations may be checked. See page 95.

up of the amount on the keyboard and turning the amount into the dials by means of a crank, or a touch bar in the case of electrically operated models. In the case of the lever-set machine, the amount is set up by means of the levers and turned into the dials by means of a crank.

KEY-DRIVEN CALCULATORS¹

Figures 14 and 15 illustrate machines which fall into the direct key-driven class. Characteristics of this type of machine are: full keyboard; answer dials located, in some cases, below the keyboard, in others, above it; and a lever at the

¹Machines of this type are manufactured by such companies as Burroughs Adding Machine Company and Felt and Tarrant Manufacturing Company.

side which clears the dials. Finally, this type of calculator is not equipped, as a rule, with auxiliary keys except in the case of one model which has a key for use in subtracting; and a second model which has a release key.

Key-driven machines for handling fractions, hours and minutes, pounds and bushels, sterling and other kinds of foreign currency are also manufactured. The capacity of the machines varies from 6 to 13 columns. Models weigh from 10 to 24 pounds.

The theoretical principles involved in this class of calculators are that multiplication and division are performed as variations of addition and subtraction.

CRANK-OPERATED CALCULATORS

As explained on page 93, crank-operated calculators may be further classified as key-set and lever-set machines.

*Key-Set Calculators.*¹ To figure with this class of calculators, the amount is first set up on the keyboard and turned into the machine by means of a crank, if hand-operated; or by a touch bar, if motor-driven. A movable carriage which is located above the keyboard has two sets of counters, which afford visibility through dials. One of these sets of dials registers the results in each of the four arithmetical operations—that is, the sum in addition, the product in multiplication, the minuend in subtraction, and the quotient in division. The other set of dials, which is smaller in size, shows only the multiplier in multiplication and the divisor in division. Each different machine has its own means for clearing the dials. Three machines of the key-set type are shown in Figures 16, 17, and 18.

A distinct method of operation is used for each arithmetical process. When adding by means of the calculator, the amounts are set up on the keyboard, in much the same

¹Machines of this class are manufactured by such companies as Ensign Company; Marchant Calculating Machine Company; and Monroe Calculating Machine Company,

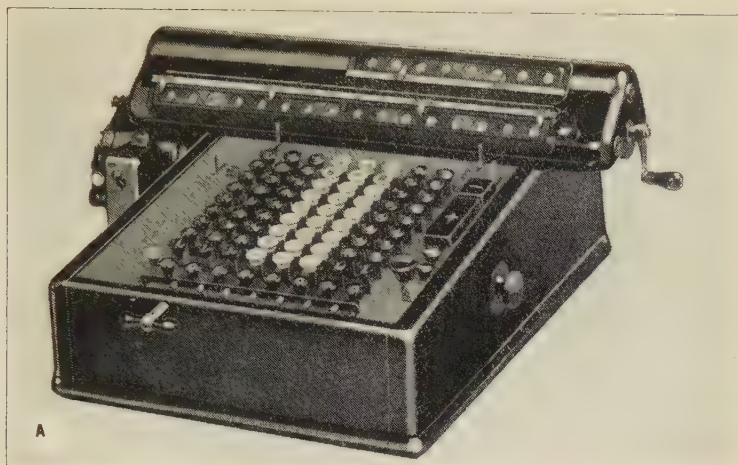
manner as when operating an adding machine. By turning the handle or depressing the touch bar, the total sum is registered in the dials. When subtracting, the amount from which a number is to be subtracted is set up first, then the amount to be subtracted. The result will be registered in the total dials. Multiplication is consecutive addition. Division is consecutive subtraction. Machines are made in varying sizes. The smallest have 6 keyboard columns, 6 upper-dial positions, and 12 lower-dial positions. The largest models have 10 keyboard columns, 10 upper-dial positions, and 20 lower-dial positions. They vary in weight from 15 to 30 pounds.

Variations from the general type are constructed to handle fractions. This type of machine will accomplish the addition and subtraction of fractions, registering the result in whole numbers and in fractions. Another variation is a machine which is constructed specially for British currency.

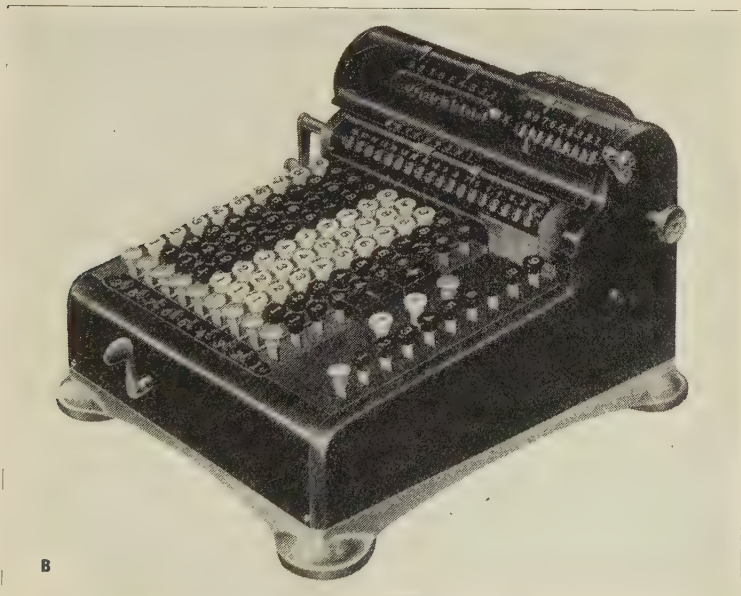
In the automatic models (that is, electric-drive calculators) certain advantages, synonymous with those advanced for electric-drive adding machines, are claimed for this type of calculator. Briefly, these advantages are increased speed and the elimination of physical effort. In some of the machines multiplication is performed by the use of a key (see Figure 17) or plus bar as shown in illustration A of Figure 19. Other styles of this type are equipped with an additional row of multiplying keys on the right, as shown in Figure 18, and in illustration B, Figure 19. This row of multiplying keys may be used instead of the plus bar. Division is performed by the operation of the minus bar. The process becomes automatic by means of locks or bell signals.

*Lever-Set Calculators.*¹ Columns of levers operated through openings in the cover of the machine characterize this type. The operation is accomplished by setting the levers at the amounts indicated along the slots. When the

¹Manufactured by such companies as Marchant Calculating Machine Company.



A



B

Figure 19: While electric, or automatic, adding machines have been in use for years, the electric-drive calculator is comparatively recent. Two electric-driven calculators are pictured here. Note in illustration A the plus and minus bar and in illustration B the row of keys at the right.

amount has been set up by means of the levers, it is turned into the machine by operating a crank. Like the key-set type, the lever-set machine is constructed with a movable carriage and visible dials (see Figure 20).

YOU CAN USE A CALCULATING MACHINE IN EVERY DEPARTMENT OF YOUR BUSINESS

In every business, large or small, wherever figure work consumes time, the calculating machine finds a place. The partial list given below of businesses which employ this machine shows that it has established itself as an indispensable office tool.

Banks	Contractors
Factories	Engineers
Railways	Government (National, State, and Municipal offices)
Insurance companies	Oil companies
Mining companies	Schools and colleges
Public utilities	Publishing companies
Retail concerns	
Architects	

Practically every department in every business deals with figures of some sort, whether it be simple addition or simple formulas. The specific uses which follow will serve to indicate the many figuring tasks which can be handled speedily, accurately, and economically with this appliance.

BOOKKEEPING DEPARTMENT

- Adding and balancing cash books
- Adding daily sales, vouchers, and charge sheets
- Adding deposit slips and checks
- Adding monthly statements
- Adding remittances
- Adding distribution of sales direct from charge slips
- Proving daily postings
- Balancing ledger accounts
- Adding trial balances
- Averaging accounts
- Figuring and proving freight bills

Proving extensions and discounts on purchase invoices
 Extending and adding inventories
 Figuring interest
 Figuring commissions
 Figuring foreign exchange

CASHIER'S DEPARTMENT

Proving postings by adding vouchers or cash slips, to
 balance against footings of cash book
 Balancing cash book
 Totaling checks
 Adding deposit slips

ESTIMATING DEPARTMENT

Figuring, totaling, and proving all extensions of quantity
 and price

COST AND STATISTICAL DEPARTMENT

Figuring piece costs
 Figuring and totaling job costs

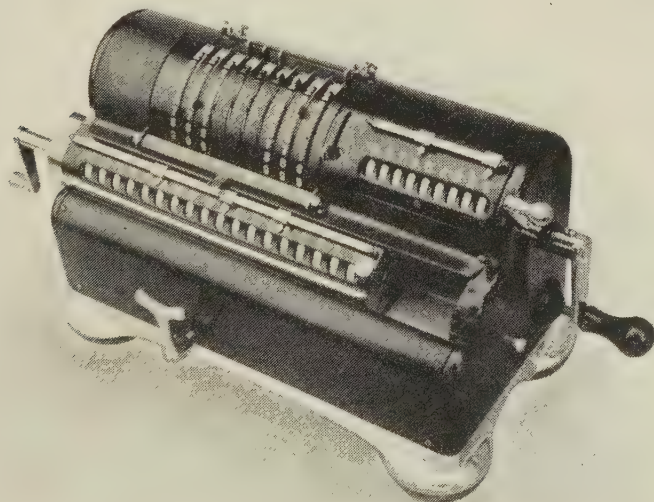


Figure 20: This machine differs from the others described in that it does not possess the familiar depressible keys, but provides for the setting up of amounts by means of levers. It has, however, a moving carriage and a crank, operation of which causes amounts to be calculated. See page 96.

- Figuring pro rata or percentage of cost, per piece, job, or department
- Figuring profits by salesman, department, or territory
- Figuring selling cost by salesman, department, or territory
- Figuring percentage of increase or decrease in sales by salesman, department, or territory

BILLING DEPARTMENT

- Original figuring of invoice extensions
- Figuring single and chain discounts
- Totaling weights or quantities on bills
- Proving extensions and footings of invoices, by accumulation
- Figuring freight charges
- Deducting freight allowances
- Figuring taxes
- Adding fractional quantities

These are typical. New uses are being discovered by business and professional men every day.

In addition to these general uses, there are many kinds of calculations peculiar to particular industries. A few of the better-known lines will indicate the great range of uses for the machines.

Railroads have, perhaps, the greatest variety of work. Freight bills, ticket reports, freight claims, performance reports of locomotives, labor, material, and compensation statistics, fuel reports running into eight figures, inter-line accounts and distributions, revenue reports and percentage divisions of items—cost per ton, per mile, per unit—engineering formulas, and construction estimates, all involve a vast amount of calculating.

Banks have interest and discount calculations, foreign exchange, average daily balances, and bond calculations, all of which require calculating-machine accuracy. Retail stores figure "mark-up," departmental percentages, and cost, sales, and so on.

Engineers have many formulas to handle: areas, latitudes and departures, trigonometric formulas, square and cube roots, mass ordinates, and level readings. All branches of

the government have statistics, percentages, and economic factors. And in every case accuracy is essential if the work is to be of any value whatsoever.

The need for the modern calculating machine is as basic as business itself. Without it, business, as it is now organized, could not be adequately controlled.

VII

BILLING MACHINES

Antiquated methods are costly. The evolution of the billing machine. Select your machine with care. Three types available. Non-computing billers: cylinder machines; flat writing machines. Billing machines that add and subtract: cylinder machines; flat writing machines. Billing machines that have adding, subtracting, and multiplying mechanisms. Versatility of the billing machine. Systems which saved the other man's dollars.

MODERN billing implies the writing of the thousands of records—requisitions, orders, invoices, bills of lading, tickets, and all other such forms—needed daily to meet the requirements of business. Several copies of each of these records are necessary; furthermore, each must not only be exact and accurate, but it must be available with the least possible delay. In factories, for instance, when a customer's order is received, many records are required before the job can get under way, and speedy production would mean little if orders failed to reach the production department promptly. In other lines of business where goods and services already produced are supplied, the need for promptness is even greater.

Practically all billing systems require several copies of each record. They may include, for instance, the customer's invoice, the bookkeeper's record, a copy for the auditor, the bill of lading, and a copy for the shipping department. Under antiquated methods of writing such records, each copy means more work, increased cost, less accuracy, and less production. Much of the operator's time is consumed in non-productive work, which means wasted dollars.

The modern business man realizes that he cannot afford obsolete methods of performing office tasks when improved

methods are available. He is doing his billing economically with a machine which combines features that make record writing an uninterrupted performance of productive work. Records and their copies are written with less work, less waste, less cost, less possibility of error, and a tremendous increase in production is effected. Such record-writing efficiency means the saving of thousands of dollars to the business world.

Billing machines are a profitable investment in the small organization as well as in the large; in fact, they soon pay for their installation in all offices where more than one-half of one clerk's time is spent in getting out any of the following types of forms:

Bills of Lading	Shipping Orders
Factory Orders	Invoices
Collection Letters	Express Receipts
Purchase Orders	Transit Acknowledgments

THE EVOLUTION OF THE BILLING MACHINE

All successful inventions are timely—that is, they appear as soon as the need for economic improvement becomes insistent. The more valuable inventions, as a rule, are not brought into existence from purely mercenary motives. Unless they have real economic value they are short lived. Billing machines in one form or another have been in use for a number of years. Manufacturers began to experiment with machines for billing based on two of the oldest members of the office appliance family: the typewriter and the adding machine.

Typewriters were sold for billing purposes as early as 1891. Some time later both the typewriter and the writing machine with a flat surface, designed for writing in bound books, were equipped with calculating mechanisms for adding and subtracting the amounts written on the forms. Another innovation was a means for handling continuous lengths of forms¹ interleaved with carbon, and fed so that as

¹See Chapter XXXIX on Billing-Machine Forms.

one set was written another came into writing position. One machine which added, subtracted, and multiplied, was a combination of the typewriter and the calculating machine. This machine performed all the jobs of billing, such as typing, adding, subtracting, multiplying, and extending the net amount of the bill in one operation.

The experience gained through the manufacture and use of divers billing machines has led to great refinements and improvements. Today the prospective purchaser can choose from among machines of many variations, adaptable to the widest range of uses.

In this book the various applications in all industries cannot be discussed, but the description of the mechanics of the equipment will indicate with clarity the really wide extent of office work that the use of these machines facili-



Figure 21: Conviction that there is a billing machine for every need will come with the reading of this chapter. Here is a non-computing biller—a typewriter with a built-in carbon-changing device which withdraws the carbons from a set of forms just written and adjusts them in the next set
See page 109.

tates. All lines of business employ mechanical means of billing. The following list will give the reader some idea of the range of uses and adaptability of billing machines:

Automobiles and Accessories	Leather and Leather Products
Bakers and Bakers' Supplies	Lumber
Banks and Bankers	Machinery
Candy and Ice-Cream	Metal and Metal Products
Carpets and Linoleum	Musical Instruments
China and Glassware	Neckwear
Cleaners and Dyers	Office Appliances
Clothing	Oil
Coal and Coke	Optical Goods
Contractors' and Builders' Supplies	Paints and Varnishes
Drugs and Chemicals	Paper
Dry-Goods and Department Stores	Plumbers and Supplies
Electrical Equipment	Printers and Engravers
Foodstuffs	Publishers
Furniture	Railroads and Steamships
Gas and Electricity	Rubber Products
Government Departments (City, County, and State)	Shipyards
Grain	Shoes
Groceries and Meat	Soap and Perfume
Hardware	Sporting Goods
Hosiery	Stationers
Household Utensils	Stock Brokers
Insurance	Storage Warehouse
Jewelry and Silverware	Sugar
	Tea and Coffee
	Textiles
	Tobacco and Cigars

SELECT YOUR MACHINE WITH CARE

Naturally the merits of any invention can be fairly judged only by its accomplishments in comparison with the results produced by similar inventions. The modern business man who is a keen, critical judge and purchaser will investigate all types of machines and determine, from the evidence available, that which best meets his needs and reduces cost by eliminating operations.

Each type of machine on the market is designed for the purpose of writing a single invoice. However, with certain machines it is possible to bring about a collation of forms, which will permit the production at one operation of various records to which the billing information is common. Some machines provide no means of computation; others automatically add and subtract amounts written on the forms; some add and subtract and cross-compute; still another machine provides for multiplication as well as columnar addition, subtraction, and cross-computation.

A study of the several types of machines described in the following pages should help the prospective purchaser



Figure 22: You can do billing with any standard typewriter equipped with a device such as this. Auxiliary typewriter ribbons instead of carbon-paper are fed between the forms. This attachment is used when only one copy is desired. Figure 23 shows an attachment for making several copies at once. See page 110 for further details.

to determine what sort of machine is best adapted to his particular kind of billing work.

THREE TYPES AVAILABLE

For the purposes of this book, billing machines will be considered under three headings:

1. Machines which do not compute;
2. Machines with adding and subtracting mechanisms;
3. Machines with adding, subtracting, and multiplying mechanisms.

The first two types may be further classified as machines with stationary keyboards which write on forms fed around a cylinder, and those with a flat surface over which the writing unit moves.

In studying these classes of billers, the reader will find that some use cut forms and others continuous-length forms. Because their rôle in the operation of a successful billing system is an important one, and because a separate treatment furthers clarity, Chapter XXXIX has been devoted to the several kinds of forms.

NON-COMPUTING BILLERS

Machines of this class, as explained before, are of two types—cylinder and flat writing. Some are designed to handle cut forms; others, continuous-length forms; and still others, to handle either.¹

*Cylinder Machines.*² Correspondence typewriters³ have, by the addition of special attachments, been made capable

¹For a description of forms, see page 803.

²Manufactured by such companies as L. C. Smith & Bros. Typewriter Company, Incorporated; Remington Typewriter Company; and Underwood Typewriter Company.

³For a description of Typewriters, read Chapter XXI.



Figure 23: A typewriter transformed into a billing machine as shown above can be used for ordinary typewriting by simply reversing the platen and disengaging the paper roll. From one to six copies can be made. The paper is fed into the typewriter at each stroke of the space lever. See pages 107 to 110 for complete details.

of turning out a number of copies. Cut forms are used with such machines.

A key-set decimal tabulator makes it possible to set the stops on the tabulator rack by depression of a key on the keyboard. The tabulator also moves the carriage to the correct decimal position for writing amounts of various denominations. Another tabulator moves the carriage from column to column by a leftward movement of the left hand.

Condensed billing can be handled with typewriters adapted for this work. By means of this type of machine, 8 or 10 separate invoices can be handled and at the same time carbon copies made upon sales sheets without removing the work from the machine.

This machine also makes it possible to write columns of classifications on the sales sheet without writing them on the invoices. Several copies of the bills and sales sheets can be duplicated in the one operation.

A machine (Figure 21) for handling continuous-length forms is a standard keyboard typewriter with a built-in carbon-changing device which withdraws the carbons from a set of forms just written and adjusts them in the next set ready for writing. For the inserting and removal of forms the typewriter platen is constructed so that it may be released and adjusted accordingly.

In order to hold the carbon paper in place the ends are attached to a device which slides across the frame work that is constructed to guide the continuous forms. The first forms are interleaved with carbon by inserting the blades between the forms and the end of the strip drawn forward under the platen, which is then dropped. When the writing is completed, the platen is raised and the forms brought forward to the form-cutting gage and cut off. At the same time, the next set of forms has been automatically interleaved with carbon and is ready for writing.

Forms of varied widths may be written at one operation, and two or more different forms may be used on the same machine. It takes only a few seconds to change; there is no

handling of the carbon-paper. Notations may be made on some copies and not on others, as desired. For instance, in a five-part form, notations may be made on the original which will appear on the fourth and fifth copies and not on the second and third.

When desired, the continuous forms with carbons may be instantly removed from under the cylinder and cut forms inserted without in any way disturbing the carbons from between the continuous forms.

This machine may be used for typing single-copy work using continuous stationery packed flat. The removal of the written form brings the next form into writing position, and an adjustable knife cuts the form any desired length.

By means of a device which is constructed specially to handle continuous forms, any typewriter can be adapted for non-computing billing work. This device will handle from one to six rolls of continuous forms. The hubs upon which the rolls are placed revolve, and the feed is automatically operated with each stroke of the typewriter space lever. The forms are written out and removed from the machine by tearing off against a sharp knife. A typewriter ribbon for each copy is threaded between the forms. Two styles are shown in Figures 22 and 23.

When only an original is desired, the style illustrated in Figure 22 is used. A typewriter so equipped can be used for ordinary miscellaneous work by reversing the platen and disengaging the roll paper, which afterwards can be loaded again.

For making several copies another style, like that pictured in Figure 23, is used.¹

*Flat Writing Machines.*² This type of machine is constructed with the typing unit mounted above the writing surface so that each stroke of a key strikes down upon the

¹Attachments are made by such companies as United Autographic Register Company.

²These machines are manufactured by such companies as Elliott-Fisher Company.

paper which is placed on the writing surface (see Figure 24). As the paper remains fixed throughout the billing process, the carriage moves backward, forward, and from side to side.

The keys are arranged according to the typewriter stand-



Figure 24: The typing unit of this non-computing biller is constructed so that the keys strike down upon the flat writing surface. Models are equipped to handle cut forms or continuous-length forms—either roll, inter-folded, or fan-fold. Such billers are equipped with standard keyboards for use of straight caps, or caps and lower-case letters. See page 110.

ard. Two styles of type may be provided also for writing different forms.

Models are of different sizes, designed to handle either continuous-length or cut forms. Continuous-length forms are fed across the writing surface from rear to front and are interleaved with strips or multiples of the carbon roll. When the writing of a set is completed, the forms are drawn to a cutting guide and all copies cut off together.

Any style of cut form may be written. On single-copy work a stack of 25 cut forms can be inserted at one time and written, one at a time, thus eliminating 24 insertions. This machine may be equipped with an adding-subtracting mechanism, as described in the section dealing with billing machines which add and subtract.

There is a billing-machine form attachment¹ which makes it possible to handle as many as nine sets of forms at a time. Each of the nine forms can be of a different color for identification and delivery to proper departments. Long forms and short forms can be used at one time. Automatically the carbons which are interleaved between the sets provide a fresh carbon surface for each writing.

BILLING MACHINES THAT ADD AND SUBTRACT

Machines of this class provide for the adding of figure items as they are written on the forms. Some add and subtract in vertical columns; others cross-compute as well as add and subtract.

As in the case of non-computing billers, this class will be taken up under the headings of cylinder and flat platen machines.

Cylinder Machines. When a standard typewriter is equipped with a calculating mechanism—that is, with an adding and subtracting device and decimal tabulator—the machine may be called a cylinder machine (see Figure 25).

¹Manufactured by such companies as Autographic Register Company.

The typewriter may be used independently of the calculator.

Addition and subtraction are accomplished by means of registers called totalizers mounted on a rack on the front of the carriage. They may be moved to any position of any column. As many as 30 totalizers may be used, depending on the number of columns to be added and subtracted. Depression of the regular numeral keys causes the adding



Figure 25: Depression of the regular numeral keys causes the amounts added or subtracted to register in the totalizers mounted on a rack in front of the carriage. Equipped with a split cylinder, this machine does the billing and ledger posting at one operation. Billing machines with adding and subtracting mechanisms are described on pages 112 to 116.

and subtracting to be performed. As they are added or subtracted the amounts register in the totalizers. When it is desired to subtract, the subtracter lever is depressed. Cross-computations as well as addition in vertical columns can be performed.

A proof-of-clearance mechanism locks the machine if an error is made in writing the balance. This is accomplished without any attention from the operator and forces the correction to be made before work can be resumed.

An electric carriage return causes the carriage automatically to return as the last figure in the balance column is depressed. It may also be returned from any intermediate position by the depression of the motor bar.

Equipped with a split cylinder, the machine can do the billing and ledger posting at one operation, automatically totaling each bill and accumulating a grand total of the billing, posting the amount of the charge to the ledger sheet, extending the new balance, and accumulating a total of all postings. This automatically proves the accuracy of both billing and posting at one operation.

Cut forms are used with this machine. A condensed sales-sheet record of all invoices written can also be made.¹

A bookkeeping machine, with an attachment called a fan-fold biller for handling continuous-length forms, is shown in Figure 26. It is equipped with an automatic return carriage and line spacer, and an electric calculating mechanism. The calculating mechanism is controlled by 20 keys—10 adding and 10 tabulating. Totals are visible in the registers below the keyboard. Models may have from one to five registers. As addition and subtraction can be accomplished by each of the registers, any one register can also be used as a cross-computing register.

A machine with two registers functions in the following way: The operator copies the items, descriptions, amounts,

¹Such companies as Remington Typewriter Company make machines of this type.



Figure 26: This bookkeeping machine, equipped with a device which withdraws carbons from a set of forms just finished, leaving the next set ready for writing, is described on page 114. The calculating mechanism is controlled by 20 keys—10 adding and 10 tabulating.

and totals from the original order. As the figures are typed, the total of the invoice accumulates in the accumulating register. At the same time, these figures are added in the other register, which is called the computing register. After each total has been entered on the invoice, the computing register may be cleared. When the register is cleared, a verification symbol—usually a star—can be printed by means of depressing the proof-star key. If the proof-star key does not work, it indicates that the register has not been cleared.

The accumulating register offers a check upon the correctness of the bills. When all the bills have been run, the

total in the register and the predetermined total should agree.

A special device withdraws carbons from a set of forms just written, leaving the next set ready for writing. Movement of a handle puts the carbons in a new set of forms as each set is written.¹

*Flat Writing Machines.*² Either continuous-length or cut forms are used with machines of this class, which are exactly like the non-calculating biller already described and illustrated in Figure 24, except that instead of being equipped with a writing head it has an adding or subtracting head which performs all the functions of the writing head and also subtracts. Figures are added or subtracted as they are written on the forms. Any number of registers up to 29, varying in capacity to meet requirements, may be used to furnish the totals of entries made in individual columns. Each register is separate and may be disengaged at will from the adding mechanism by use of a non-add key. If, for a form on which there are, say, five columns of figures, the total of each column is desired, five registers will furnish the individual totals. Instead of the head equipped with adding and subtracting registers, one which adds and subtracts and also cross-computes may be used.

BILLING MACHINES THAT HAVE ADDING, SUBTRACTING, AND MULTIPLYING MECHANISMS³

A typewriter and calculating mechanism combination which handles addition, subtraction, and multiplication is shown in Figure 27.

Since the operation of the typewriter unit does not depend in any way upon the operation of the calculator unit, the ma-

¹This type of biller is made by such companies as Underwood Typewriter Company.

²Manufactured by such companies as Elliott-Fisher Company.

³Made by such companies as Burroughs Adding Machine Company.

chine can be used for the typing of any desired information, such as addresses, descriptions of items, and so on.

Just below the standard keyboard of the typewriter unit is the keyboard of the calculator unit. This calculator unit will print, add, subtract, and multiply. The machines come in several models that will figure practically all kinds of fractions and, when desired, give or take odd half-cents.



Figure 27: The calculating mechanism of this type of billing machine, operated from a separate keyboard below the typewriter section, prints, adds, subtracts, and multiplies fractions as well as whole numbers. Billing and ledger posting can be done at the same time by means of a split platen.

The operation is explained beginning on page 116.

The red keys to the left of the keyboard which controls the calculating mechanism are used for addition and subtraction and for registering the number to be multiplied. Black keys to the right of the keyboard are used for multiplying only. On them is registered the number by which the number written on the red keys is multiplied. To the left of the red keys are the result keys, by means of which total differences and products are printed. The calculating mechanism controlled from this keyboard consists of from one to five front registers and one rear register, a multiplier, and a subtracter.

When using this type of machine for addition, the red numeral keys are first depressed. The amounts appear in the front register. By depressing one key only, the total may be obtained. Each of the registers may be operated independently of the others, or totals may be transferred from the front register to the rear. For instance, amounts may be added in each of the five front registers, and then, the grand total of the entire amount taken by depressing one key. Or the amount in one of the front registers may be carried to a rear register and retained as a subtotal.

The rear register acts as an accumulator or summary register. As a result in multiplication is obtained, the product may be retained in the rear register and at the same time carried to the front register. In one sense the front register is "active" and the rear register is a "reserve" or "retainer" register.

When it is necessary to add in front and rear registers at the same time, the rear register acts as a cross-footer. In subtraction, the minuend is introduced into the rear register automatically, by depression of the keys, or transferred from one of the front registers.

The subtrahend is put in the machine. Depression of the subtracter key causes the subtraction to be made automatically. The result in the rear register is printed automatically by depressing one key only and is automatically transferred to the active front register where it accumulates for

a grand total. In multiplication, the multiplier functions in the following manner: The multiplicand is carried into the multiplier from the keys to the left of the keyboard or is transferred from the rear register or one of the front registers. The multiplier is then registered on the multiplying keys. The product at the end of the multiplying operation is printed automatically and transferred to the active front register where it accumulates with other products for the net total of the invoice. For instance, if 58 is to be multiplied by 9, 58 is set up on a keyboard and introduced into the multiplier, the "9" is written on the keyboard, and then, while tabulating, the multiplying key "9" is depressed. Multiplication is performed instantaneously and the result is printed automatically by depression of the product key.

A simple invoice illustrating multiplication is shown in Figure 28. Quantity and description are typed and the price of 8.75 is then printed and registered in the multiplier.

Take the first line in the invoice, for example. Depression of the black "5" key automatically causes the machine to operate and multiplies the quantity in the multiplier (8.75) by 5. Tabulating to the net amount column,

SUBJECT TO SIGHT DRAFT IF NOT PAID AT MATURITY PRICES SUBJECT TO CHANGE WITHOUT NOTICE		ALL MERCHANDISE AT BUYER'S RISK OF TRANSPORTATION ALL CLAIMS TO BE MADE WITHIN FIVE DAYS	
Velvet Hosiery Company			
MANUFACTURERS AND IMPORTERS OF			
A MERCHANT	FINE HOSIERY		
ANYWHERE U S A			
TERMS NET CASH 30 DAYS OR 1% 10 DAYS			
SHIP VIA B & O		OUR ORDER 1590 YOUR ORDER 131	
QUANTITY	DESCRIPTION	PRICE	NET AMOUNT
5	DOZ BLACK HOSE	8 75	43 75
9	DOZ CORD	9 45	85 05
27	DOZ WHITE	9 45	255 15
11	DOZ SILVER	19 25	211 75
6	DOZ NUDE	20 00	120 00
			715 70

Figure 28: Reference to this simple invoice will simplify the detailed explanation of the operation of the billing machine pictured in Figure 27. See the explanation above.

the result is printed by depressing the final product key and touching the motor bar. This clears the rear register and transfers the result into the third front register where it is stored. When all extensions have been made, the net total of the bill is printed by depressing the front total key and touching the motor bar.

One type of machine can also be equipped with a split platen, which permits billing and posting to the ledger in one operation.¹ This machine makes as many as 15 carbon copies, and can be equipped with the condensed billing device.

VERSATILITY OF THE BILLING MACHINE

In general, the billing machine presents the same advantages as all office appliances—it saves time and labor and therefore effects an economy. But no matter how ingenious a device may seem to be, the prospective purchaser wants to know just how it will actually improve his office practice. Therefore, to give an idea of what a billing machine can do, some of its many applications are listed below:

BILLING

Single Bill System	Combination Bill, B/L, Express, Receipt, or Delivery Slip
Multiple Bill System	
Combination Bill and Charge System	Combination Bill, and Label, Packing Slip
Combination Bill and Order	Tax Bills
Service Bills	

ORDERS

Single Order Systems	Installation Orders
Multiple Order Systems	Meter Settings
Combination Order, B/L, Express, Receipt, or Delivery Slip	Job Orders
Combination Order and Invoice	Production Orders
Purchase Orders	Factory Route Orders
Work Orders	Sales Orders
Plant Orders	Shop Orders
	Storeroom Orders
	Shipping Orders
	Route Orders in Factories

¹Machines of this type are manufactured by such companies as Burroughs Adding Machine Company.

REQUISITIONS

Requisitions	Job Requisitions
Store Requisitions	Service Requisitions
Purchase Requisitions	Cash Requisitions
Material Requisitions	Individual Requisitions

MISCELLANEOUS

Bills of Lading	Tickets
Express Receipts	Sales Tickets—Prepaid or Collect
Parcel-Post Receipts	Public Bills
Local Delivery Receipts	Inspection Calls
Receiving Reports	Stores Invoices
Returned Merchandise Receiving Memoranda	Ship Requisitions
Packing Slips	Engineering Data Sheets
Shipping Labels	Insurance Renewal Notices
Labels	Bank Collection Letters
Way-Bills	Bank Collection Letters—Coupon
Freight or Express Billing	Bank Notices to Indorsers—Non-Payment of Discount Notes
Prepaid Freight Billing	Bank Notices—Errors Made in Deposits
Freight Correction Notices	Bank-Note Ticklers
Express Billing—Collect or Paid	Foreign Drafts—with Accompanying Ticket Sets
Arrival Notices	Cashiers' or Treasurers' Checks
Shipping Notices	Brokers' Confirmation—Bond or Stock Purchases
Loading Lists	Brokers' Confirmation—Bond or Stock Sales
Crew Lists	Brokers' Customer Receipt—Exchange of Temporary for Permanent Bonds
Permits	Brokers' Record—Branch Bond Shipment
Bills of Material	Brokers' Interim Exchange Tickets
Freight Claims	Brokers' Purchase and Sales
Time Tickets	Brokers' Cashier
Pay Slips	
Pay Checks	
Check-Writing	
Remittance Letters	
Remittance Receipts	
Vouchers	
Telegrams	
Tax Receipts	
Guest Cards	
Sales Tickets—Cash or Charge	

To describe all these applications would obviously be impossible in the short space which has been allotted to this subject. However, since the interested reader will wish to know how the other man has saved dollars by improved billing methods, a brief description of a number of typical applications is given below. Scores of businesses not already using such systems can profit by the experiences of others related here.

SYSTEMS WHICH SAVED THE OTHER MAN'S DOLLARS

When an industry is as big as the oil industry, producing in gasoline alone more than six billion gallons, supplying thousands of customers, accuracy is most important. The billing work alone is tremendous. One oil corporation with a large billing department kept the clerks at work all day long. At 4 o'clock the checking of totals began. Accuracy was secured at a great deal of expense. By adopting a standard set of forms, including an original invoice, copy of an invoice, home-office accounting division copy, branch-office file copy, and home-office statistical division copy, and using it with a billing machine which calculated, the size of the billing department was reduced to four operators and four machines, with four relief operators. Salary expense was reduced in this department because the totals were audited at the same time the invoices were made. Errors thus became a minus quantity and accuracy was assured. Every department which gets a copy of the invoice is sure that it has the same information that has gone to other departments.

Automobile manufacturers are cutting billing costs by using improved methods of invoicing. With 85,082 automobile dealers, garages, repair shops, and supply stores that buy a large number of parts for repair and replacement from the various manufacturers, it is evident that the spare-parts business is tremendous. Each manufacturer

must get his share of the business, and to meet competition he must get orders to customers promptly. When an order arrives at the factory there are usually four records to be made out—the invoice to the customer, the accounting department copy, the sundry department shipping copy, and the cost department copy. If each of these is made out separately and laboriously checked for correct totals after the day's invoices have been copied, there is a considerable amount of time lost in getting the order started. With up-to-date methods the work goes along smoothly and shipments are not held up because of delays in billing. That keeps the customer satisfied and builds good-will for the car and the maker.

The manufacturer of electrical supplies is somewhat in the same position as the automobile manufacturer. He must carry a large supply of spare parts for making repairs and replacements. When these are ordered they are wanted in a rush. The invoices and other records must go through quickly. The usual forms in such a case are the invoice to the customer, the accounting department copy, parts supply department shipping copy, and the cost department copy. There may be a number of others. With a billing machine all the copies are made at once and the correctness of the figures is proved when the invoice is made out. Orders are not held up while the billing clerk checks back over the day's figures to hunt for some error—any error is corrected at the time it is made. Another good feature that an electrical manufacturer finds valuable is that when the billing is finished the billing forms can be taken out and the machine used for another purpose, such as making out shop and material orders. This is just another way which assures the customer that his order will arrive when he wants it, for the same speed can be attained in doing this work as in the regular billing.

In the clothing industry, business conditions as well as styles may change overnight. The manufacturer who has

his goods ready to ship and ships them earliest in the season is the manufacturer who does the big business. Manufacturing must wait on selling, as in many other industries, and prompt shipment clinches many sales.

Any one who has seen the sidewalks in New York's clothing-manufacturing districts piled high with cartons waiting for the expressman cannot help but realize the importance of having all the forms promptly made out and the express receipts ready for the truckman to sign.

More than one clothing manufacturer recognized the importance of doing this and has installed a machine billing system. These eight forms are used in a typical system:

Invoice to Customer	Salesman's Copy
Packing Slip and Label	Uniform Express Receipt (Original)
Shipping Department Copy	Uniform Express Receipt (Duplicate)
Manufacturing Department Copy	
Bookkeeper's Charge Sheet	

When the customer's order has been taken, the original sales slip goes to the billing clerk. These eight records are filled out as rapidly as one can be typed.

This system not only reduces the number of clerks necessary, but increases the amount of work that can be turned out in a day. It helps get the styles to the customers when they are ready for them, not two weeks after the season is under way.

In probably no other line of business is there the demand for speed in recording transactions that we find in the stockbroker's office. Market changes are so rapid that notifications of purchase and sale must go to the purchaser or the seller, as the case may be, within 24 hours at the most, sometimes within a much shorter period. Quick action is essential when large amounts change hands, often instantly. For these reasons, as well as because they save salaries of many clerks, billing machines have found a wide use in stockbrokers' offices.

The most important application in this instance is the use in getting out purchase and sales notices. The various records which are made in such a system are:

Purchase and Sales Notice	Blotter Entry
Comparisons in Duplicate	Bookkeeping Department
Delivery Ticket	Record

The usual method is to have one clerk to take charge of each of these records. Yet when a billing machine is installed and this work consolidated, an approximate saving of four of the five people doing this work can be made. All the operations are combined. The five forms are filled out at once. Not only does the broker save the salaries of the four who previously did this work, but he has the work done more quickly, and, what is more essential, accurately.

There is no chance for some of the forms to be correct and some incorrect. All copies are alike and they are all audited for correct totals immediately after they are written.

A commission merchant selling textiles has found a way to get rid of the hampering details of the old method of making out invoices. The five forms required are the invoice to the customer, the duplicate invoice to the customer, the posting copy, the sales record, and the contents memorandum. Each has columns for style, number, case number, piece number, yards, total yards, price, amount, and total. In addition, there are five "boxes" for bales, cut, pieces, cases, and packages. Think of getting all this information on all the copies by the old method. When all this information has been entered, the total number of yards and the total selling price have been computed in the calculating mechanism. These figures are proved. The invoice is audited, and it can be forgotten with pleasure at once instead of being remembered with displeasure a few weeks later. To finish the job, the address has been written in a space in proper position for use in a window envelope, thus making another saving in time which might otherwise be used in addressing.

Billing machines are extensively used in the writing of transportation records. Years of experience have demonstrated that the application of these machines to railroad billing is a profitable investment. Take, for example, interline abstracting. The routine incident to interline abstracting is very much similar in all railroad organizations. Of course, there is a slight variation in the routine and column arrangements; but in the main, the work involved in the collection of way-bills and reports from agents in posting them to the accounts of associated lines, and in the preparation of divisional statements varies but little, and the ambition of every management is to have all such work done with the least expenditure of time and money possible. The same general plan of procedure is followed by all roads where machines have been applied to interline abstracting.

Briefly described, interline abstracting follows the receipt of way-bills attached to station reports after they have been checked and sorted by roads and stations.

The operators post the way-bills to the station abstracts, making, at the same time, a continuous record of way-bills received at a given station. This record provides the total of weight, freight, advance and prepaid charges without further work or effort.

After all the way-bills from a given station are entered in the proper abstract, the continuous record is submitted for comparison with the station agent's report and if the totals agree, the work is proved correct.

In the event of a difference, a visual check of the record quickly locates the error. Thus the necessity of checking individual way-bills against the daily received report on the individual abstracts is eliminated. At the end of the month the abstract totals by stations and roads are taken and subsequently consolidated into a summary grand total of all abstracts for the month. This total must agree with the grand total of all the agents' daily received reports for the month. The abstract reports are then entered to the divi-

sion statement, and the proportion of freight charges due the operating road and its connecting lines is shown.

Public utility companies use billing machines for consumers' billing. The routine of such work does not vary much. One company carries three distinct ledger cards. A single card is used for gas charges, and two others for electric and power service. A considerable number of payment meters are operated in the city in which this company renders service, and although no bill is rendered in connection with payment meter service, the entire accounting relating to the consumption furnished by this means is handled on a billing machine. The machine computes the actual consumption, indicates the old balances, or credit from the previous collection period, adds the amounts collected at the present period, subtracts the amount actually used, and indicates the new balance to the credit of the consumer. Complete control is secured over the profit and loss of each account, and for the prepaid meter system as a whole. The monthly sales summary which, under previous methods, required from two to three weeks, is now obtained in a few days.

These uses, of course, are a very small number of those which might be described, but they serve to illustrate the possibilities of billing-machine systems.

Many companies using billing machines have added to their equipment in order to keep pace with growing needs, which proves, better than any amount of argument, the exceptional worth of those machines, demonstrated, as it is, by the real test of time and experience.

VIII

BOOKKEEPING MACHINES

Why mechanical bookkeeping is replacing handwritten bookkeeping. Bookkeeping terms defined. Methods of posting: the dual plan; the combined plan. Methods of proof: old- and new-balance proof; checking against a predetermined total; proof-sheet method; split-platen method. Bookkeeping machines evolved from adding machines. Bookkeeping machines which combine writing, adding, and subtracting features. Bookkeeping machines of cash-register origin. How the bookkeeping machine serves business.

BECAUSE of the complexity of the once simple art of bookkeeping, any proposal to carry it on by means of machinery sounds impossible on the surface. Yet in thousands of concerns today, old-fashioned methods of bookkeeping have been replaced by bookkeeping machines which add, subtract, compute, and enter balances, prove the correctness of posting, and so forth, with remarkable speed and mechanical precision. The bookkeeper must do all these things one at a time; the accounting machine consolidates all operations, and also furnishes proof of the accuracy of the computations involved.

The ultimate end which every executive has in view, when new or additional office equipment is being considered, is economy—savings resulting from the elimination of unnecessary operations, the assurance of greater accuracy through perfect accounting control, and making the work easier for the personnel engaged in performing it. That explains why bookkeeping machines have found a wide distribution.

In offices where the old methods have been abandoned in favor of bookkeeping machines, the executive has a bird's-eye view of the day's business. Each morning the vital statistics of the business, up to the minute in every detail

and proved correct, are placed before him. Conditions in every department are revealed; sales, purchases, and stock can be watched and intelligently directed.

In concerns where old-fashioned methods are still used, the ledger is balanced but once a month and serves merely as a book of record. With machine bookkeeping, new balances are extended with every posting, and the ledger thus becomes a real guide. The accounts receivable ledger, for instance, becomes an aid to the credit man or to any one in the business who is interested in the ratio between accounts collected and the volume of charge transactions. It is good business to limit the credit of every charge customer, and when the balance is extended with every posting, it is possible to tell at any time if a customer has exceeded the credit limit. Of course, all of this could be done with pen-and-ink methods, but on account of the huge amount of work involved, it is rarely undertaken.

A bookkeeping machine, to take care of modern accounting, must provide for speed, legibility, ease and simplicity of operation and, especially, accuracy and control—correct adding, subtracting, computing, balancing, and proving of figures; the elimination as far as possible of transcribing figures so easily transposed in rewriting; the making of records of the same general class at one writing; the elimination of checking, proving, and hunting errors. These requirements are all successfully met by the bookkeeping machine. But the most vital factor in machine bookkeeping is admittedly the production of final results—the proved figures required at stated intervals—in the minimum of time consistent with the maximum of efficiency.

Just how well the bookkeeping machine has been able to take over the bulk of accounting is evidenced by the growing number of concerns in which the old methods have been abolished. Banks, manufacturers, retail and wholesale firms, commercial organizations, railroads, steamship lines, hotels, and clubs—in fact, all kinds and sizes of businesses

are finding that the saving effected by machine bookkeeping justifies the cost of installation.

Not only in large concerns where whole batteries of machines are necessary for the production of figure results are bookkeeping machines finding a place, they are, also, demonstrating their ability to save time and money and give accurate results in the small business as well.

Modern bookkeeping machines developed from machines which would add, and subtract.

The established principles of bookkeeping with which the average reader is familiar are not altered when the work is done by mechanical means. Procedure, however, is simplified and all details are handled in the same manner.



Figure 29: The established principles of bookkeeping are not altered when the work is done mechanically. One type of bookkeeping machine is an adding and direct-subtracting machine equipped to print set terms. A tabulating carriage moves automatically to the next column as each amount is registered. The model shown above has a full keyboard. See page 137.

Because of difference in design, the operation to obtain the same results varies with the several types of machines on the market. In the pages which follow, each type will be described, as well as the procedure in making a simple posting.

It is evident that in so limited a space as has been allotted to this subject each particular use cannot be touched upon; for that reason, only the functional operations involved in posting accounts receivable will be explained. Each step in the process will be illustrated on the following pages.

The prospective purchaser may choose from three distinct classes of machines: the product evolved from the adding machine; the combined writing and adding machine; and the type which follows cash register design.

BOOKKEEPING TERMS DEFINED

Familiarity with terms peculiar to bookkeeping is necessary for the understanding of what follows; therefore, before proceeding further, an explanation of such terms relating to an "accounts receivable" ledger will be given.

Bookkeeping. The systematic recording of business transactions in books prepared for the purpose is bookkeeping.

Original Record. A canceled check, a check stub, a receipt, charge slip, cash register tape, duplicate invoice, order, or any written or printed record of the beginning of a transaction is known as an original record. The method of compiling, recording, and classifying financial information contained on original records is a *bookkeeping system*.

Debit and Credit. A charge made for anything that goes out of the business is a *debit*. An entry for that which comes into the business in payment of goods purchased on a charge basis or returned goods is a *credit*.

Posting. The operation of entering on the proper ledger

accounts and in the proper columns such information as the date, folio number, description, the amount of debit and credit, and the balance is called posting.

Posting media. All records, original or secondary, from which information for posting is taken, are known as posting media.

Ledger. A ledger is a book of accounts, a set of cards or ledger sheets, in which a page or a card is reserved for each account, and all entries concerning that account may be posted from a journal or from an original record.

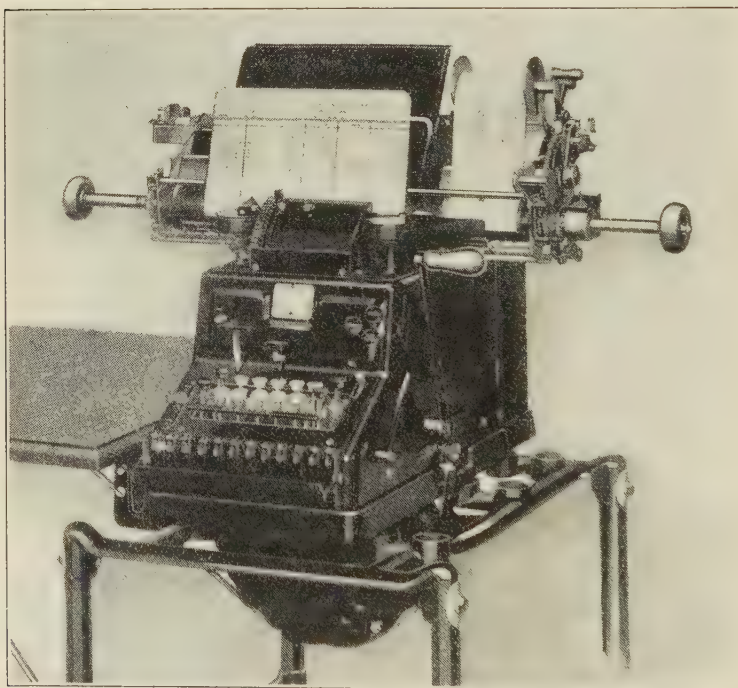


Figure 30: Bookkeeping procedure is simplified by mechanical substitutes for the pen, and all details are handled in the same manner. Above is shown a 10-key machine with a device for printing words and writing set terms. The method of posting ledger and statement is explained in detail on page 142

Pick-up. The last balance on an account just prior to the current posting is called the pick-up or old balance. It is entered as the old balance in order that a new debit may be added or a new credit subtracted, or both, to obtain a new balance.

Debit Posting. Debits are printed in the debits or charge column and are added to the old balance.

Credit Posting. Such a posting is printed in the credits column and is subtracted from the amount of the old balance.

New Balance. The amount remaining after a debit has been added or a credit subtracted from the old balance is a new balance.

Active Account. An account to which a certain number of debits or credits are posted each month is called an active account. (Note: Open accounts are not necessarily active. It is customary, in most businesses, to set an arbitrary period beyond which an open account, as it discloses no current transactions, is considered open merely, and no longer active.)

METHODS OF POSTING

Two methods of posting accounts are used when keeping books by machines; they are the dual plan and the combined plan.

The Dual Plan. By this method the ledger and statement are posted at separate runs. A comparison of the balances on both ledger and statement will prove that items were posted to the correct account, that balances were extended correctly, and so forth, if these two amounts agree.

The Combined Plan. Both ledger and statement are posted and a proof of both taken at the same time by this method. On some machines the statement is a carbon-copy of the ledger, or vice versa; on others the platen is divided

to provide for the handling of ledger sheet and statement at the same time. Items posted to the ledger and balanced are automatically repeated on the statement. Still another machine posts the ledger, writes the statement (both original) and furnishes a proof of the work, all in one operation.

METHODS OF PROOF

To prove the accuracy of postings, the following methods are used:

Old- and New-Balance Proof. This method is based on the fact that the difference between the last balance and the

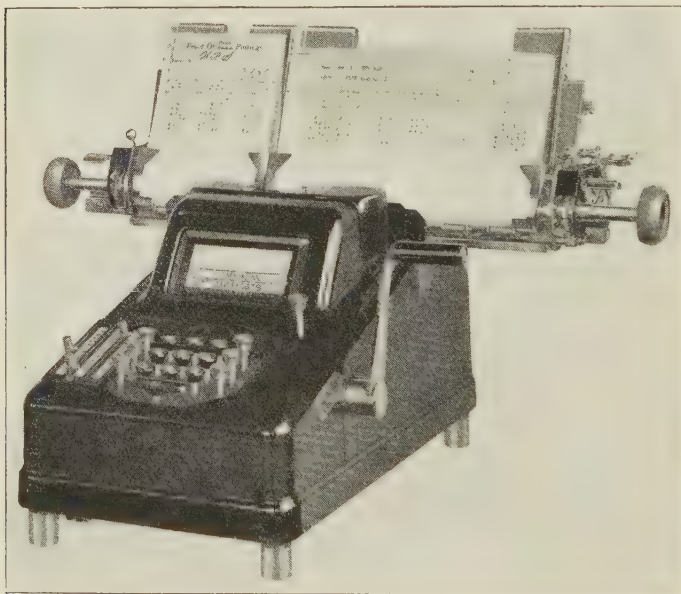


Figure 31: In concerns where laborious methods have been abandoned in favor of machines, the executive has the vital statistics of his business before him every day. Such figures reveal conditions and aid in directing sales and purchases and all the activities of the organization. Here is another machine of the 10-key variety equipped to handle bookkeeping tasks. See page 145.

one just preceding should be equal to the amount which has just been posted to the account. All accounts to which postings have been made during the day are placed in an offset position as they are returned to the tray or binder, so that they can easily be segregated. When the proof is taken, the new balance is added while the old balance is subtracted, thus leaving the difference between all old and new balances in the machine. For example, if a charge of \$10 is added to an old balance of \$15, the new balance will be \$25. The difference between \$15 (old balance) and \$25 (new balance) equals \$10, the amount of the posting shown. The total of the differences between old and new balances is then checked against a predetermined total of debits or credits posted to the ledger.

With some machines the totals of new balances, credits, or debits are obtained during the process of posting to the ledgers or statements. How this affects the method of proving will be made clear under the more detailed explanations of the operation of various types of bookkeeping machines which will follow.

Checking against a Predetermined Total. A control figure is a total of debits or credits posted to a ledger or a section thereof. Its use in proving the correctness of a posting is based on the fact that the sum of the amounts charged to the various accounts affected should equal the total of the amounts on the original records pertaining to the same transactions. For example, the predetermined or control total of charge sales for one day should agree with the total of debits posted to accounts receivable for the same day. This control figure, or predetermined total, then becomes a proof figure and there only remains to be assured that the total of the differences (on a posting run of debits) equals the predetermined total of charge sales.

Proof Sheet. The proof sheet is an original or a carbon-copy (dependent on the construction of the machine) of postings made on a ledger or statement.

Split-Platen Method (Direct Proof). Some machines have the platen or roll divided into two sections. Either the right- or left-hand section holds the proof strip, a reproduction of which is shown in Figure 29. The right-hand section holds the ledger card or sheet. After each credit is posted, and the balance extended, the amount of the credit posted is automatically printed on the proof strip. When all credits have been posted, the amounts on the proof strip are added. If the correct amounts have been posted, a total of all items on the proof strip will agree with the predetermined total of credits. (The predetermined total of credits is run off before posting is started. Amounts are listed in the order in which they will be posted to the various accounts.) A proof of debit postings is handled in the same

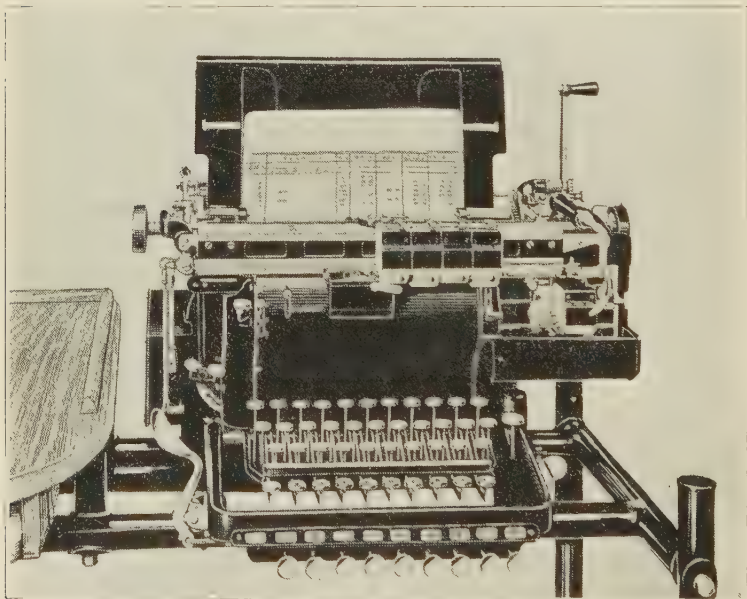


Figure 32: Totalizers placed on the carriage truck, in positions corresponding to the columns to be added, are operated by a mechanism connected with the numeral keys on the keyboard of this machine. A vertical totalizer makes it possible to secure vertical totals. Machines which combine writing, adding, and subtracting features are described on page 147.

way. If an error has been made, it can be found by comparing the list of items on the proof strip with the predetermined list. Certain models permit the ledger and statement to be made and the items listed on the proof strip at the same time.

BOOKKEEPING MACHINES EVOLVED FROM ADDING MACHINES¹

This type of machine consists of an adding and direct-subtracting machine of either the full keyboard or ten-key variety² equipped with means for printing the dates, folio numbers, descriptions, debits, credits, and extending balances. A tabulating carriage moves automatically to the next column as each amount is registered. Certain models have an automatic motor-driven device which returns the carriage to any position on the printing line.

Some machines of this class have one counter and therefore can only compute the individual balances; others have two counters, which make it possible to compute individual balances and accumulate a total of all postings.

Subtraction is direct and is controlled by means of stops on the carriage or by a lever on the keyboard. Items are set up the same as on an adding machine, and operation of the motor causes them to be printed in the proper column and to be added or subtracted. Dates and folio numbers are non-added. When the machine has been cleared, a distinctive character is printed with the new balance. This, in a general way, describes machines of this class. Because of slight differences each machine will be accorded separate treatment.

A machine of the full keyboard type is pictured in Figure 29. The model has calendar and descriptive keys to the left of the keyboard. Keys in every section of the keyboard

¹Made by such companies as Burroughs Adding Machine Company; The Dalton Adding Machine Company; Federal Adding Machines, Incorporated; Sundstrand Adding Machine Company.

²For description of Adding Machines, read Chapter V.

may be used at the same time so that dates, folio numbers, description, and amounts may be printed simultaneously. All dates, folio numbers, characters, and symbols are printed in red. When the "add and subtract" lever is at the upper end of the slot in which it operates, the machine adds; and when it is at the lower end, the machine subtracts. Items subtracted are printed with the minus sign. The machine computes and prints the new balance automatically. Credit balances are designated with the symbol CR—closed accounts with the symbol OO*. This machine is equipped with a motor-returned carriage.



Figure 33: With a bookkeeping machine, each account is balanced mechanically as the merchandise, debits, cash, credits, and other entries are posted. This model, the operation of which is explained on pages 151 and 152, contains a number of stationary registers located below the typewriter keyboard.

On some models the statement is made at the same time as the ledger is posted, and it is an exact copy of the debit and credit items as shown on the ledger. This is made possible by a split platen and a repeat-print mechanism.

It is also possible to post the ledger, write the statement, and make the proof on a tally roll at the same time. The amount is set up and operation of the machine causes it to be printed in the proper columns on the ledger. The machine then automatically shifts to the statement, repeats all the information in the proper columns, and extends the balance. Following this the machine shifts to the balance column after the ledger and the new balance is again posted; then the tally roll strip automatically shifts into position.

Below and on the next page is shown the method of posting on the direct-proof type of machine, which is equipped with a split platen. The left, or smaller, portion of the platen holds the proof strip. Because of the split-platen, ledger sheets may be put into the carriage or taken out of it while the proof strip remains in place. Each step in the operation is illustrated on the ledger and the addition and subtraction of amounts in the accumulator are also shown as they appear on the counters within the machine.

In the first operation, the balance carried forward is put

Name				Salesman		Style		Machine No.		Motor No.		S. S.	
Address													
County													
Date	Memor.	Folio	Charges	✓	Date	Memor.	Folio	Credits	✓	Balance			
SLIP 3										275.00 3			



into the machine in a non-print position. The amount of the charge, \$65, is then set up on the keyboard, with date, de-

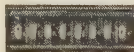
scriptive characters, and folio. Depression of the operating bar causes them to be printed simultaneously in the proper column, and the amount of the charge posting is automatically added to the old balance in the counter.

Name Address County				Salesman		Style	Machine No.	Motor No.	S. S.	
Date	Memo	Folio	Charge	✓	Date	Memo	Folio	Credits	✓	Balance
SEP 3										275.00 s
SEP 3 3:0	1 1 1		65.00							



Then the carriage automatically tabulates to the balance column, where the balance is automatically printed with an "s," indicating that the amount is still in the counter. The carriage returns automatically to the proof strip, and the add and subtract lever goes automatically into subtracting position. The amount of the old balance is set up and subtracted. The carriage automatically tabulates to the second position on the proof strip, where depression of the operating bar and total key causes the remainder to be printed. This is the amount of the charge posting, and is marked with a star, indicating that the counter is cleared.

Name Address County				Salesman		Style	Machine No.	Motor No.	S. S.	
Date	Memo	Folio	Charge	✓	Date	Memo	Folio	Credits	✓	Balance
SEP 3										275.00 s
SEP 3 3:0	1 1 1		65.00							340.00 s



When a credit amount is posted, the old balance (the last amount printed in the balance column) is picked up. When the machine is operated, the amount is placed in the counter, but a hammer-blocking device prevents its being printed. The carriage automatically tabulates to the credit column where date, descriptive characters, folio, and the amount of the credit are printed. The correct date prints automatically and the amount of the credit is automatically subtracted from the previous balance.

Name				Salesman		Style		Machine No.		Motor No.		S S	
Address													
County													

Date	Memo	Folio	Charges	✓	Date	Memo	Folio	Credits	✓	Balance
SEP 3										275.00 3
S_R 3	00	1 1 1	65.00		Oct 3		2	25.00 -		340.00 3



The carriage automatically tabulates to the balance column, where the new balance is printed, and then the carriage automatically tabulates back to the proof strip, where a proof of credit posting is taken just as the previous proof of charge posting was taken, except that the amount printed on the proof strip is indicated with the symbol "Cr," indicating "credit," when the counter is cleared.

340.00- 28.00-

Salience	Boyle	Markham	Morse	No	S

Name _____

Address _____

Country _____

User	Memo	Pulse	Charges	V	Date	Memo	Pulse	Credits	V	Balance
SLP	3									275003
SLP	3	301	2 2 1							340003
			6500							
					SLP	3	50	4 2		2900-
										315003

Figure 30 illustrates a two-counter machine with 10 keys. By means of a printing device, certain words and names may be printed, such as the name of the month. The principal characters are on the keyboard and are operated through a keyboard control. An auxiliary keyboard below the regular keyboard prints the dates. Totals are printed automatically. Credit balances (overdrafts) are automatically printed in red. The method of operation follows:

The old balance is set up and recorded on the sheet. The

SHEET NO		NAME				
RATING		ADDRESS				
TERMS		CREDIT LIMIT \$				
OLD BALANCE	DATE	FOLIO	MEMO	CHARGES	CREDITS	NEW BALANCE
275 00 *	DEC 10-25 1 1 1					275 00 *



B



A

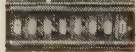
folio is then recorded, at which time the dates print automatically, the carriage tabulating automatically to proper columns. At the same time the amount is added in B counter.

The charge amount, \$65, is then set up, printed in the charge column, and at the same time is added to the old balance in B counter.

SHEET NO		NAME				
RATING		ADDRESS				
TERMS		CREDIT LIMIT \$				
OLD BALANCE	DATE	FOLIO	MEMO	CHARGES	CREDITS	NEW BALANCE
275 00 *	DEC 10-25 1 1 1			65 00 *		275 00 *



B



A

The new balance is printed automatically as a subtotal, with a distinct character as the carriage tabulates to that position.

SHEET NO		NAME				
RATING		ADDRESS				
TERMS		CREDIT LIMIT \$				
OLD BALANCE	DATE	FOLO	MEMO	CHARGES	CREDITS	NEW BALANCE
275 00	DEC 10-25	1 1 1		65 00		275 00 340 00



B



B



A

The carriage tabulates automatically to the first position on the tally roll. The amount of the old balance is again picked up and automatically subtracted, the carriage tabulating to second position on the tally roll where the amount of the posting is printed and automatically transferred to the A counter, at which time B counter is cleared automatically. The carriage, having returned automatically to the old-balance column, is ready for the next posting. The amount, \$340, is set up. Operation of the machine causes it to be printed and added in the B counter.

SHEET NO		NAME				
RATING		ADDRESS				
TERMS		CREDIT LIMIT \$				
OLD BALANCE	DATE	FOLO	MEMO	CHARGES	CREDITS	NEW BALANCE
275 00 340 00	DEC 10-25	1 1 1		65 00		340 00



B



A

The carriage tabulates to the credit column where the credit amount is posted. It is subtracted automatically from the old balance in B counter.

SHEET NO		NAME			
RATING		ADDRESS			
TERMS		CREDIT LIMIT \$			
OLD BALANCE	DATE	FOLIO	MEMO	CHARGES	NEW BALANCE
275 00+	DEC 10-25 1 1 1			65 00+	275 00+
340 00+				25 00--	340 00+



B



A

The new balance is printed as a subtotal with a symbol or character as the carriage tabulates to the new-balance column. The amount is still retained in the B counter.

The carriage tabulates automatically to the first position on the tally roll. The amount of the old balance is again picked up and automatically subtracted, the carriage tabulating to second position on the tally roll where the amount of the posting is printed and automatically transferred to the A counter, at which time the B counter is cleared automatically.

To prove that all charges or credits have been posted

SHEET NO		NAME			
RATING		ADDRESS			
TERMS		CREDIT LIMIT \$			
OLD BALANCE	DATE	FOLIO	MEMO	CHARGES	NEW BALANCE
275 00+	DEC 10-25 1 1 1			65 00+	275 00+
340 00+				25 00--	340 00+



B



B



A

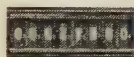
correctly to the accounts and that the old balance of each affected ledger sheet has been correctly picked up, the difference between the old and the new balance is recorded on the tally roll and is accumulated in the A counter of the machine. After all charges or credits have been posted, a total

of the postings can be secured from the machine and checked against the control figures or a predetermined total that was established before posting of the ledgers was started, thus automatically proving the correctness of the work.

Another 10-key machine (Figure 31) prints months and other characters by means of sliding levers located at the left of the keyboard. Before starting to post, the calendar levers are set by hand; the month and date will then continue to print automatically throughout the day but only in proper column of forms as may be indicated by their heading. The movement of the carriage is automatic, tabulating from column to column, non-adding, or adding or subtracting in the proper column.

In posting a ledger account, the sheet is placed in the car-

OLD BALANCE	DATE	FOLIO	MEMO	CHARGES	CREDITS	NEW BALANCE
275.00	DEC 10	111				275.00



riage and brought to proper printing position. The old balance is first picked up and printed in the old-balance column; the carriage then automatically moves to the folio column—the date printing automatically in this column while the folio is being printed and non-added.

The carriage then tabulates automatically to the charge or

OLD BALANCE	DATE	FOLIO	MEMO	CHARGES	CREDITS	NEW BALANCE
275.00	DEC 10	111		65.00		275.00



credit column, according to whether a debit or credit item is being posted, and finally to the new-balance column where the machine is "cleared," and the new balance printed.

A total is taken and as it is printed the counter clears.

OLD BALANCE	DATE	FOLIO	MEMO	CHARGES	CREDITS	NEW BALANCE
275.00	DEC 10	111		65.00		275.00 340.00



To post a credit amount the old balance is set up and printed; then the credits are in turn set up and printed in

OLD BALANCE	DATE	FOLIO	MEMO	CHARGES	CREDITS	NEW BALANCE
275.00 340.00	DEC 10	111		65.00	25.00	275.00



the credits column and subtracted from the amount in the counter as the machine is operated.

When the total key is depressed and the motor operated, the new balance is printed with the symbol of clearance and the counter is cleared.

OLD BALANCE	DATE	FOLIO	MEMO	CHARGES	CREDITS	NEW BALANCE
275.00	DEC 10	111		65.00	25.00	275.00 315.00



BOOKKEEPING MACHINES WHICH COMBINE WRITING, ADDING,
AND SUBTRACTING FEATURES¹

The design of this class of bookkeeping machine embodies a writing, adding, and subtracting mechanism built as a complete unit. In addition to the amount, any description may be written just as on an ordinary typewriter.²

Figures 32, 33, 34, and 36 show machines which fall under this heading. Because of structural differences, each will be described somewhat in detail.

Adding is performed, on the machine illustrated in Figure 32, by totalizers placed on the carriage truck in positions corresponding to the columns to be added. The totalizers are operated by a mechanism which is connected with the number keys on the keyboard, and all adding and subtracting is performed through a gear-driven mechanism as the keys are depressed. One machine of this type is equipped with a vertical totalizer which makes it possible to secure the necessary number of vertical totals. Both addition and subtraction may be accomplished in any or all columns. Another machine includes a cross-totalizer, so that in addition to the vertical totals a cross-total or balance may be automatically secured.

The proper decimal position in each column is secured by a device called the decimal tabulator, which moves the carriage to the exact writing position. The machine automatically locks if a mistabulation is made. If an incorrect amount is written, the error is corrected by depressing the correction key and rewriting the amount.

The machine may be equipped with from 1 to 30 vertical registers which operate in any desired combination with the cross-totalizer. Addition can be performed in a vertical totalizer while subtraction is performed in the cross-total-

¹Machines of this class are manufactured by such companies as Burroughs Adding Machine Company (Moon-Hopkins); Elliott-Fisher Company; Remington Typewriter Company; Underwood Typewriter Company.

²For description of Typewriters, read Chapter XXI.



Figure 34: From the start, a bookkeeping machine will effect a saving, no matter how large or small the concern in which it is installed. Read about this machine on pages 153 and 154. It has 10 numeral keys located below the typewriter section, in addition to the numeral keys in the regular typewriter keyboard.

izer, or vice versa. Columns may be added vertically and cross-added, or cross-added and not added vertically, as the work may require.

When some vertical columns are added and others subtracted, as in the posting of debits and credits, the cross-totalizer shows the final net total. When the cross-footer does not clear, all numeral keys lock.

The machine is equipped with a motor carriage return

END BAL	DATE	DESCRIPTION	FOLIO	DEBITS	CREDITS	NEW BALANCE
	DEC 10	Balance Brought Forward	11			275.00

which automatically returns the carriage as the last figure is written, or the carriage may be returned from an intermediate position by the depression of a lever.

Ledger entries and statements may be made in one operation by using a carbon, or the platen split so that the ledger may be inserted at one end of the carriage and the statement at the other end.

When the amount of the old balance is typed, it is introduced into Register 1 and also into the cross-footer. The date and folio number are typed in the columns so headed.

The carriage is moved to the memo column, where the description is typed, then to the charge column. Typing the amount of the charge causes it to be added in Register

2 and also in the cross-footer. The operator then types the amount of the credit which adds in Register 3 and subtracts from the amount in the cross-footer.

LEDGER

NAME NAME OF CUSTOMER
ADDRESS ANYTOWN U S A

OLD BALANCE	DATE	DESCRIPTION	FOLIO	DEBITS	CREDITS	NEW BALANCE
275 00	DEC 1	Balance Brought Forward	11	65 00		275 00
	10	MERCHANDISE				

REGISTER 1 REGISTER 2 REGISTER 3 REGISTER 4

Then the operator reads the amount appearing in the cross-footer and types it in the new-balance column. If it has been read and typed correctly, the amount appears in

LEDGER

NAME NAME OF CUSTOMER
ADDRESS ANYTOWN U S A

OLD BALANCE	DATE	DESCRIPTION	FOLIO	DEBITS	CREDITS	NEW BALANCE
275 00	DEC 1	Balance Brought Forward	11	65 00		275 00
	10	MERCHANDISE	CB 7		25 00	
		CASH				

REGISTER 1 REGISTER 2 REGISTER 3 REGISTER 4

Register 4, and the cross-footer clears. If it has not been read or typed correctly, the machine locks.

Separate totals of debits, credits, and balances are automatically accumulated, thus providing proofs of the work as soon as the last item has been posted. A summary of all postings can be made on an automatic tally toll of any width up to the maximum width of the machine.

LEDGER

NAME NAME OF CUSTOMER
ADDRESS ANYTOWN U S A

OLD BALANCE	DATE	DESCRIPTION	FOLIO	DEBITS	CREDITS	NEW BALANCE
275 00	DEC 1	Balance Brought Forward	11	65 00		275 00
	10	MERCHANDISE	CB 7		25 00	315 00
		CASH				

REGISTER 1 REGISTER 2 REGISTER 3 REGISTER 4

Another machine of this class, seen in Figure 33, has an electric calculating mechanism. This type of machine can be equipped with as many as seven visible registers. Addition and subtraction may be carried on in any one register or in all of the registers at the same time. Tabulation—that is, the placing of the carriage in the correct column position—is accomplished by means of a 10-key decimal tabulator. Any register or totalizer may be used in cross-tabulation. The bar which moves the carriage is equipped with stops, the design of which governs the action of the registers.

The registering unit is entirely independent from the type-writer unit. It is operated by means of electric contact.

A star must be printed following the writing of each bal-

ance and after the clearance of the various registers to prove that the correct amounts were written. Ledger and statement are made at the same time with a carbon, and a continuous proof record can be made simultaneously.

In the illustration of operation which follows, the registers may be numbered from 1 to 4. Register 2 has been selected as the cross-footer.

OLD BALANCE	FOLIO	DATE	MEMO	CHARGES	CREDITS	NEW BALANCE
275.00	111	DEC 10				275 00



The old balance is typed in the old-balance column and is added in Register 2. The folio and date are typed in their proper columns.

Then the description is typed and the amount of the charge is added in Register 1 and also to the old balance in Register 2.

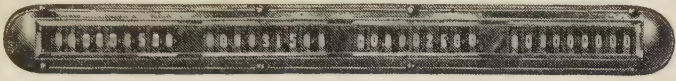
OLD BALANCE	FOLIO	DATE	MEMO	CHARGES	CREDITS	NEW BALANCE
275.00	111	DEC 10	1 DRESS	65.00		275 00



The credit posting is made by typing the amount in the credit column, which causes it to be added in Register 3 and subtracted from the amount in Register 2.

The operator then types the balance found in Register 2 in the new-balance column and if correct it will automatically subtract out of the register and allow a star, the symbol

OLD BALANCE	FOLIO	DATE	MEMO	CHARGES	CREDITS	NEW BALANCE
275.00	111	DEC 10	1 DRESS CASH	65.00	25 00	275.00



of clearance, to be printed after the amount. At the same time, this amount is transferred to Register 4.

OLD BALANCE	FOLIO	DATE	MEMO	CHARGES	CREDITS	NEW BALANCE
275.00	111	DEC 10	1 DRESS CASH	65.00	25.00	275.00 315.00*



At the end of the day or upon completing the day's posting, the total of old balances subtracted from the total of new balances, that is, the difference between Register 2 and Register 4, should equal the difference between the total of debits and the total of credits as shown in Registers 1 and 3.

Figure 34 illustrates still another type of combined writing and adding machine. The typewriter section which has the standard typewriter keyboard is used for typing all descriptions.

A separate typewriter-style 10-key keyboard located below the typewriter section controls the calculating mechanism which consists of a rear register or cross-footer, from three to five front registers (depending on the model) and a subtracting device. Beside the numeral keys there are several result keys whose functions are as follows:

Subtract Key. This key subtracts the amount set up in the subtracter from the amount in the cross-footer. This is the only key that clears the subtracter.

Balance Key. Its function is to clear the cross-footer and transfer the total to the active front register; it transfers the negative amount from the cross-footer to the subtracter.

Credit Balance Key. Depression of this key clears the cross-footer. It also causes the credit balance to be printed in red and non-transfers the amount to the front register.

Sub-Balance Key. This key retains a sub-total in the cross-footer and non-transfers it to the front register.

Credit Register Key. A number registered on red keys is set up in the subtracter by means of this key. It also adds the amount in the active front register if the add or extend lever is out.

Debit Register. This is used to add amounts in the cross-footer.

Front Total Key. Its function is to clear the active front register.

Rear Total to Subtracter Key. For transferring a total in the cross-footer directly to the subtracter, this key is used. If the add or extend lever is out, the amount will also add in the active front register, except when under rear register control.

Motor-Bar Release Key. This is used to release the motor-bar-lock, which is a signal that a negative balance is in the cross-footer.

Lineal and vertical, duplex, triplex, or quadruplex addition can be performed on the machine illustrated by Figure 34. Totals are transferred automatically from one accumulator to another. Subtotals and grand totals can be accumulated. Other features of this machine are the automatic tabulators, the automatic date, and the carriage return.

Figure 35 illustrates the application of this machine¹

¹Manufactured by such companies as Burroughs Adding Machine Company.

Simplex, writes, adds, subtracts, and provides the totals in vertical columns; the other, called the Universal, writes, adds, subtracts, and computes both vertical and horizontal column totals.

The individual adding registers are mounted to the rear of the typewriter unit (see Figure 36). There may be as many as 29 registers, depending upon the requirements of the work. A cross-computing register operates with a column register; that is, it may be moved into operating position as the column register is moved. The column registers, however, may be operated independently of the cross-computing register by eliminating corresponding engaging stops.

The vertical and cross-computing registers may be operated at the same time. By means of adjustable stops the movement of the writing unit is controlled.

In addition to posting ledger and automatic audit-sheet or statement, the flat writing machine is especially valuable for writing in bound books. The book page or ledger sheet to which the posting is to be made is placed face up on the writing surface and remains there during the operation without any necessity of changing the position. The writing unit may be placed in the correct column position by means of a 10-key decimal tabulator. This writing unit is equipped with a keyboard similar to the standard typewriter, so that any desired description can be written in addition to the writing and computing of the numeral totals.

The amounts are set up in the registers as they are typed. To operate the Universal machine the carriage is moved to the old-balance column where the amount is typed. (Debits and credits may be included and accumulated in the same run.) As it is typed, the amount, \$275, is added in the first register and also in the cross-computing register. The illustration at the top of page 158 follows this operation across the ledger page up to the point where the description of the transaction has been written. The entry is made and computed at the same time.

Continuing the line entry the invoice charge of \$65 is

NO. 14-27-71 USE STATEMENT FORM 302 SOLID PUNCHED		RATING		PAGE NO.		NAME HENRY JAMESON ADDRESS 318 MAIN STREET CITY		ACCOUNT	
OLD BALANCE	NO.	DAY	ITEMS	CHARGES	CREDITS	BALANCE	LIMIT		
275 00	111	DEC 10	BALANCE FORWARD 1 DRESS			275 00			




entered in the debit column and simultaneously added in the second register and in the cross-computing register. The latter, at this point, shows the accumulated balance, \$275, plus the charge, \$65, or a total of \$340.

NO. 14-27-71 USE STATEMENT FORM 302 SOLID PUNCHED		RATING		PAGE NO.		NAME HENRY JAMESON ADDRESS 318 MAIN STREET CITY		ACCOUNT	
OLD BALANCE	NO.	DAY	ITEMS	CHARGES	CREDITS	BALANCE	LIMIT		
275 00	111	DEC 10	BALANCE FORWARD 1 DRESS	65 00		275 00			





If a credit is to be posted to the account, the machine head is moved back to the description column and the amount of the credit is added in the third register and automatically subtracted from the cross-computing register, as shown on the following page.

When the carriage is in position in the new-balance column, the amount appearing in the cross-computing register is set, and the star control key can then be released, provided the cross-computing register is cleared, which indicates that the amount set is correct. As the cross-computing register

MS 5425-21M USE STATEMENT FORM BY SOLID PUNCHED		RATING		PAGE NO.		NAME HENRY JAMESON ADDRESS 318 MAIN STREET CITY		ACCOUNT LIMIT	
	OLD BALANCE	NO.	DAY	ITEMS	CHARGES	CREDITS	BALANCE		
★	275 00	111	DEC 10	BALANCE FORWARD 1 DRESS BY CASH	65 00	25 00	275 00		



clears, the amount of the new balance is added in the fourth register. What is known as an automatic audit sheet is made

MS 5425-21M USE STATEMENT FORM BY SOLID PUNCHED		RATING		PAGE NO.		NAME HENRY JAMESON ADDRESS 318 MAIN STREET CITY		ACCOUNT LIMIT	
	OLD BALANCE	NO.	DAY	ITEMS	CHARGES	CREDITS	BALANCE		
★	275 00	111	DEC 10	BALANCE FORWARD 1 DRESS BY CASH	65 00	25 00	315 00	★	



at the same time the ledger and statement are posted. This gives a summary of all transactions.

BOOKKEEPING MACHINES OF CASH-REGISTER ORIGIN¹

As the reader will see from Figure 37, machines of this class have the keyboard characteristics of cash registers.² This machine (Figure 37) is designed for ledger posting and instalment accounts.

¹Machines of this class are manufactured by such companies as National Cash Register Company.

²For description of Cash Registers read Chapter XVI.

The machine automatically posts and balances ledger accounts, printing each posting in the proper column. Printing may be done in either four, five, or six columns. The machine automatically computes and prints the amount of the balance outstanding on each account.

Debits and credits are classified, and a total of each class accumulated. As many as 18 individual totals and two group totals may be obtained.

The same entries may be printed on one or two forms—the ledger card and the pass-book or duplicate-record—according to the particular work for which the machine is being used.

The machine is built to print in its proper column a complete, detailed record of all postings on a strip of paper inside the machine. This serves as an audit or tally sheet and is a permanent record of all postings made during the day. The totals are printed on this sheet whenever they are read or cleared.

Inasmuch as all records, including the customer's record, the ledger card, and the audit sheet, are printed at one operation, they must agree. The totals of debits and credits accumulated in the machine prove the correctness of the work.

Figure 38 shows the customer's pass-book and ledger card posted at the same time the transactions occur. The application of the bookkeeping machine to instalment posting is as follows:

The customer's balance, as shown on the ledger card, is recorded on the old-balance total by setting up the amount on the keyboard at the left. The pass-book and ledger card are then placed on the printing table and the amount of the payment set up on the amount keys and the account number on the descriptive number keys—the keyboard to the right. When the motor bar is depressed, the amount paid is printed in the payment column and added on the proper total. The customer's account number is also printed in its respective column. The balance lever is then set,

and when the motor is operated, the amount of the new balance is printed in the new-balance column. The date is automatically printed in its proper column in this operation.

Successive payments or purchases are recorded in the same manner.

HOW THE BOOKKEEPING MACHINE SERVES BUSINESS

Modern business men are forever striving to save time and money, and searching for methods which assure accuracy. They have learned that the more automatic the performance of an office task becomes, the more quickly, accurately, and economically it is accomplished. Bookkeeping, they know, is no exception to this rule.

Time and labor are saved, trial-balance trouble and delay avoided by having daily proof of the correctness of records which the bookkeeping machine makes possible. Its installation in offices has reduced the number of clerks, increased output, eliminated overloads, thereby giving to the executive the vital statistics of the business for guidance,

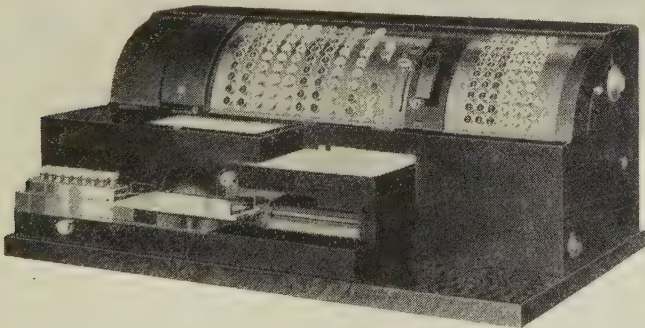


Figure 37: One class of bookkeeping machines is of cash-register origin. The posting model illustrated above is described in detail on pages 159 and 160. One of its important uses is for instalment posting.

and facilitating the control of the financial end of the business.

The profit which comes from the elimination of errors due to the human element is no small one, as the few applications of bookkeeping devices given here show.

9 ACCOUNT NUMBER

NAME **John Brown**
ADDRESS **216 Main St.**

1279

Printed in U. S. A.

	Date	Purchase	Payment	Balance	Account No. - Trans.	Remarks
1	12 16 24	★★ 200.00		★★ 200.00	..1279=Co A	
2	12 16 24		★★ 10.00	★★ 190.00	..1279=CPA	
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

	Date	Purchase	Payment	Balance	Account No.
1	12-16-24	★★ 200.00		★★ 200.00	..1279=Co A
2	12-16-24		★★ 10.00	★★ 190.00	..1279=CPA
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

Figure 38: The customer's pass-book and ledger card reproduced here will help the reader to understand the posting machine's application to instalment posting. Bookkeeping machines have been designed to meet every possible requirement. How well they have saved time and money, and increased accuracy, is demonstrated by the ever-growing number of concerns which cannot do without them.

In concerns where bookkeeping devices are used, there is no frenzied pursuit of elusive figures and totals which the pen method makes necessary. Customers' accounts are always in balance; statements are mailed promptly at the close of each month, and collections respond accordingly.

The bookkeeping machine is successfully solving the bookkeeping problem in thousands of concerns. This service alone would be sufficient to establish it firmly as a part of the equipment of every office. However, that is but one of the reasons why an increasing number of firms are finding that they cannot afford to do their figuring the old way.

IX

ACCOUNTING AND TABULATING MACHINES

Importance of compiling facts. Origin of tabulating devices. Principles of operation. Accounting and tabulating equipment: cards; punching machines; sorting devices; tabulators. What accounting and tabulating machines do for business.

IN order to appreciate fully the value of the accounting and tabulating equipment and its work, it is paramount that one realize the importance of compiling facts and the relationship of those facts to every-day business. Current facts—up-to-date figures—are the mainsprings in any accounting, cost, budgeting, or operating control system, and it is upon the rapid and accurate assembling of these facts that such systems depend for their effectiveness. History may be of value educationally and as a matter of comparison, but business is not operated on the past to any great extent; what it needs, again, are up-to-date, current facts.

The task of collecting business data is a tremendously involved, very costly operation when attempted by human effort alone, and the ever-present possibility of error usually leaves a doubt as to the accuracy of manually compiled data. Furthermore, the growing demand for high-speed labor at nominal costs makes it almost imperative that the age-old, slow, inaccurate, and costly methods of gathering data be supplanted by some mechanical substitute.

In response to the urgent plea for such mechanical devices came the development of the modern accounting and tabulating equipment. How thoroughly it has accomplished its mission is apparent to the most casual observer. In almost every field of human endeavor the accounting and tabulating machines have become indispensable for the ascertaining of actual facts, and as such are of great importance

to the busy executive. With the organized information which this equipment supplies, he learns the trend of business, locates readily the strong and weak points in the simplest or most intricate business organization, and discovers faulty spots in time to remedy them. With manual methods and a cumbersome clerical force, however competent, the executive is bound by red tape and must wait until it is unraveled before determining policies. Modern business is carried on at top speed, and, in order to meet strong competition successfully, it is absolutely necessary to keep pace with it. Antiquated methods slow up a business just as excess weight makes a plow horse out of a racer. It is almost impossible to get up-to-date information with out-of-date methods.

With the advent of the tabulating machine, the gathering



Figure 39: The typewriter key-punch records the original information on the punch card simultaneously with the typing of the original document, in one operation. Also, the key-punch machine may be used as a separate unit.

of data becomes an automatic operation rather than a manual proposition. Business men realized from the very outset that the remarkable service of the tabulating machine could be utilized in business practice, and they were prompt in adopting it. The flexibility of the equipment has found favor with every one who has used it.

THE ORIGIN OF TABULATING DEVICES

The success of the tabulating machine may be traced back to the necessity for compiling the United States Census—which, in itself, is a mighty undertaking even with mechanical devices.

In 1880 the attention of Dr. Herman Hollerith was drawn to the need of mechanical methods for census tabulation. Because of his connection, as statistician and chief clerk, with the census of that year he was in a splendid position to study the situation and devise a machine to take care of the work. The result of his study was a system whereby any given data could be designated or compiled by means of perforated printed cards on strips of paper. These strips or cards were used as the basis of operation of all subsequent tabulating machines.

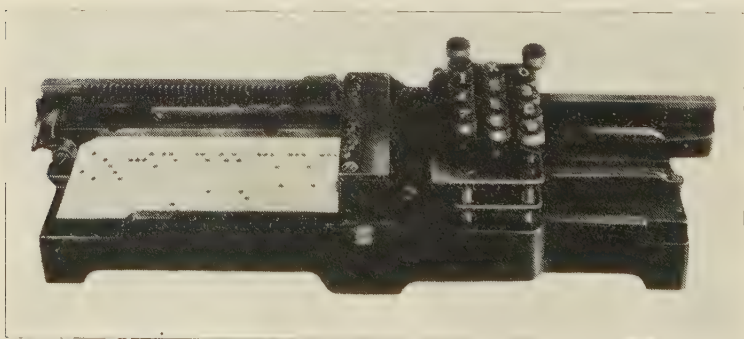


Figure 40: Here is another type of key-punch machine which is operated in a manner similar to a typewriter. By means of depressing the keys a hole is punched and the carriage moves to the next position. For further details, read the sections on punching machines, page 169.

In 1889 Dr. Hollerith patented this machine. Since that time, and following the general adaptation of tabulating machines to every-day business, many improvements have been made in electric tabulating-machine equipment, although the principles of Dr. Hollerith's method have remained much the same.

Some years later (1907) a series of mechanical tabulating devices were invented by James Powers when he was called to Washington to design statistical-accounting machines to aid in the compilation of the returns of the 1910 census. Mr. Powers was allowed to patent his inventions, and a few years later (1911) he organized his company. His machine was put on the market in 1913. In the meantime, a number of punching machines had been manufactured by the government for the 1910 census in addition to the Hollerith machine, which was already in use.

At the present time there are three types of accounting and tabulating-machine equipment on the market: one which

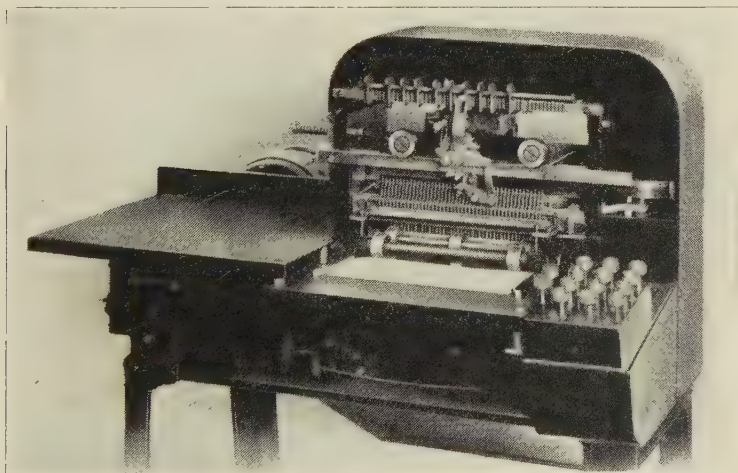


Figure 41: This type of key-punch machine is used where the information is taken from the card itself. The depression of the keys sets up the mechanism, and when all of the data on the card are set up, the depression of a trip key feeds and punches the card automatically.

operates by electrical contact;¹ a second which operates by mechanical contact;² and a third which operates on the cash register principle.³ Although there are differences between the three types of machine, in the case of the first two types the principle—to compile data by means of contact—is the same. There are certain other principles which are common to all groups of tabulating-machine equipment. In the first two types cards are punched according to data taken from written records; in the third, a visible audit sheet is made within the machine. For the first two types, contact through the holes in the cards—electrical or mechanical—is established, which sets in motion mechanism that automatically sorts or tabulates according to the information required.

After the tabulating cards have been properly punched, they may be placed in a sorting or tabulating machine and the contact mechanism adjusted to sort or tabulate all the data which had been punched in the cards. As the cards are fed into the machine, contact is established through the proper holes on to the operating mechanism which, in turn, sorts the cards or tabulates the results automatically.

ACCOUNTING AND TABULATING EQUIPMENT⁴

The first two methods of tabulating are dependent upon four devices: cards, punches, sorters, and tabulators. In each system the basic record is the card, on which all information is recorded by means of punched holes.

¹Manufactured by The Tabulating Machine Company Division of the International Business Machine Corporation.

²Manufactured by the Powers Accounting Machine Corporation.

³Manufactured by the National Cash Register Company.

⁴Tabulating machines made by the Tabulating Machine Company Division of the International Business Machine Corporation are leased and sold. The electric key-punches, tabulators, and sorters are leased on a monthly basis; contracts cover service and maintenance. The hand key-punches, gang punches, cards, and supplies are sold. Tabulating machines made by the Powers Accounting Machine Corporation are leased on a monthly basis in the United States; contracts cover service and maintenance. Only cards and supplies are sold. The National Cash Register equipment is sold outright.

The Cards. Two sizes of tabulating cards are used—the short form, on which are printed 34 vertical columns of figures numbered from 0 to 12; and the long form, of 45 vertical columns also numbered from 0 to 12. Each card is made out in a condensed form by using figures, letters, and symbols to designate certain information. By ruling off the cards into columns, positions are created. Each of these positions, which are sometimes called fields, designates certain facts. To further facilitate identification, colored cards may be used.

Punching Machines. The first step in the process of preparing material for accounting and tabulating machines of the first two types is the punching on cards of such data as can be furnished by the daily business records. With this in hand the operator of the punching machine can proceed to transcribe the data on the card. The key-punch, which is the unit that records original information, operates similarly to a typewriter, but proficiency in its use can be more easily acquired.

There are variations in the types of key-punches, each with a modification or improvement over the hand key-punch. Where it is essential that the entire card be punched at a single operation or the perforations duplicated on more than one card, special punching devices have been provided. On many original written records there is usually information common to all of them, such as dates, departments, branches, and so forth. To do away with the necessity of punching these items individually, card by card, a kind of multiple punch is used which perforates from one to twelve cards at one time with one or more perforations; or the same results may be accomplished through a mechanism which is embodied in one kind of punch known as the automatic key-punch, and which is used where the card itself is not the source of the information to be perforated in the card.

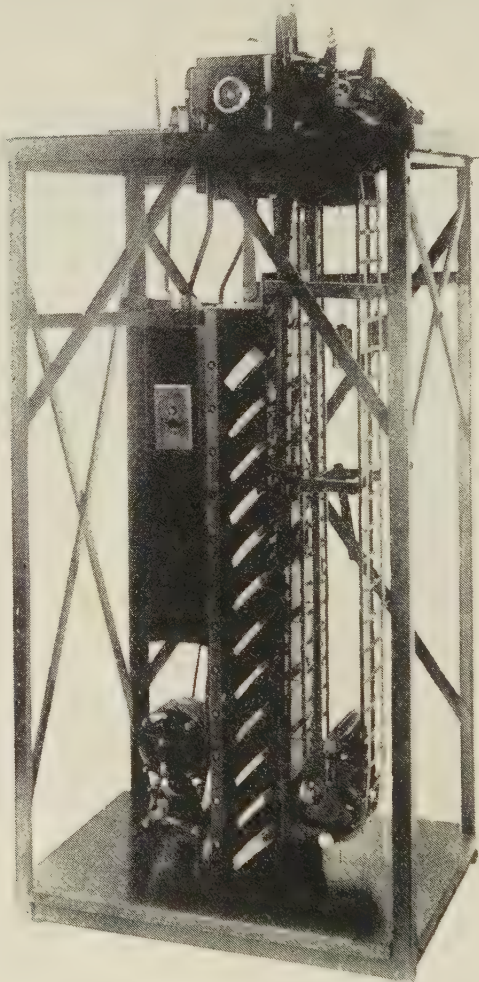


Figure 42: The sorting machine electrically arranges the cards in sequence of classification. For example, cards may be arranged in pay-roll order, rearranged for labor distribution, and according to job number, part number, or operation, for charging off completed orders. Complete details are given on pages 172 and 173.

Figure 39 illustrates a punching machine which is called a typewriter key-punch. The holes punched by this machine can be made to represent all the important facts of a business transaction and serve as a basis of any desired report of analysis. Figures recorded by this method always retain their accuracy, because punched holes are not subject to change or transposition. Cards which have been stored away for a period of time are always available for re-analysis, for they may be run through the machines as readily as new cards.

The depression of a key sets up the perforating mechanism and, as each depression is made, the carriage moves one space; the machine is then ready to receive the next depression (see Figure 40, on page 166). Likewise, in this respect the key-punch operates on the same principle as the typewriter and it enables the operator to work as rapid-

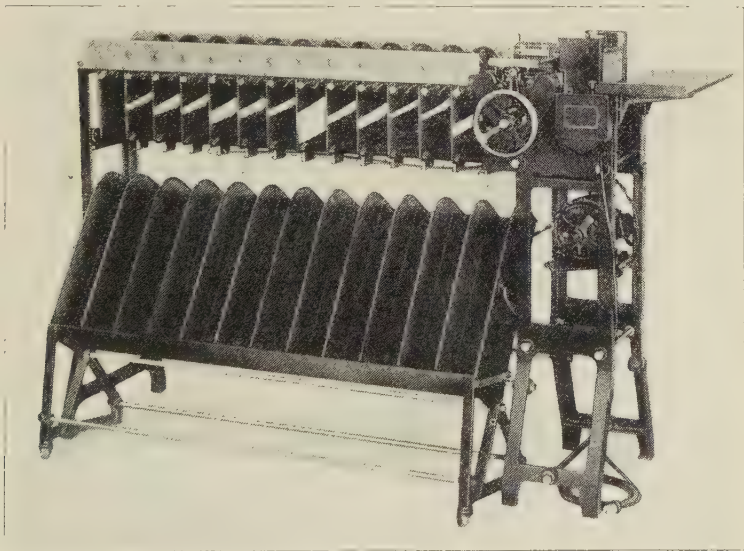


Figure 43: This type of sorting machine also automatically arranges the cards in sequence of classification. For example, cards may be arranged in commodity, account, name, territory, or other order, as desired.

ly as the information can be read from the original records and transmitted to the key-board without first readjusting the card.

Another kind of punch is the visible key-punch (see Figure 41) used where the information to be punched is taken from the card itself. The slide-punch is used to handle repetitions; the electric key-punch where a slight depression of a key causes an electrical contact mechanism to complete the operation.

Sorting Devices. The next step in the compilation of the data from the punched cards is sorting to any desired order. To facilitate this work, machines known as sorters have been devised which automatically arrange the cards in

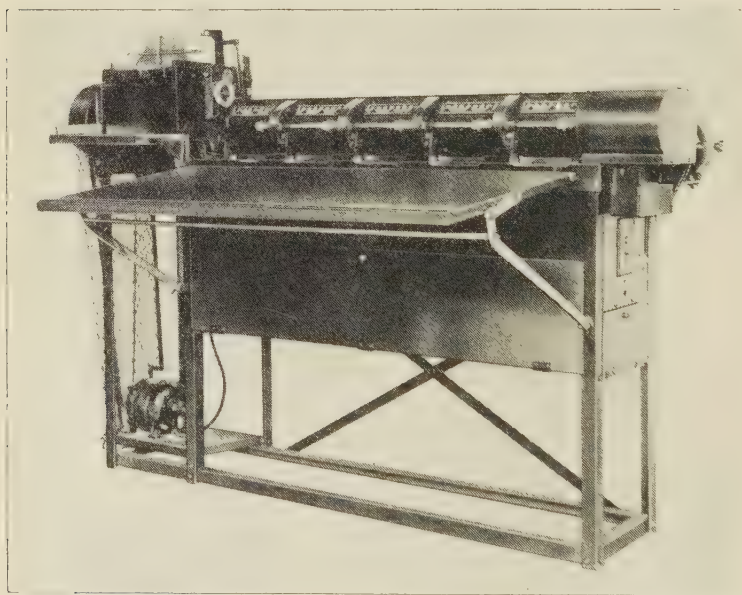


Figure 44: Here is one type of tabulating machine. As the cards pass through the machine, the quantities and amounts are registered in counters which accumulate the total of the punched information. After the cards of each group have been totaled, an automatically controlled device stops the machine to permit the posting of the figures to report forms.

sequence of classification.¹ This operation may be carried on at the rate of 250 to 325 cards or more a minute and continuously until all the cards have passed through the machine. By this method, for example, labor cards may be arranged in pay-roll order, rearranged for labor distribution and according to job, part number, or operation, for the charging off of completed orders; or separated by departments or machines for time study. Devices for counting² each classification of cards as they pass into their proper places give an accurate count of classified items that are run through the machine. Two types of sorting machines are illustrated by Figures 42 and 43.

Tabulators. The final step in gathering data is to tabulate them in such a manner as to enable the executive to see exactly how his business is progressing; whether there are any weak spots; whether certain departments are eating up the profits of other departments; whether certain machines are working to their utmost capacity; in short, to determine exactly where his business stands.

The perforated cards, having been properly arranged by the sorting machine, are then automatically fed through the accounting and tabulating machine.³ The contact established through the cards causes the machine to designate and add, automatically, that which has been perforated into them, listings, grand totals, totals, or subtotals being obtained, depending on the arrangement desired for reports.

Where the nature of the work is such that detail listing or total printing is not required, a non-printing tabulator is used. Figure 44 pictures the electric non-listing tabulating

¹Manufactured by the Tabulating Machine Company Division of the International Business Machine Corporation and the Powers Accounting Machine Corporation.

²Devices of this kind are manufactured by such companies as Powers Accounting Machine Corporation.

³Manufactured by The Tabulating Machine Company Division of the International Business Machine Corporation and Powers Accounting Machine Corporation.

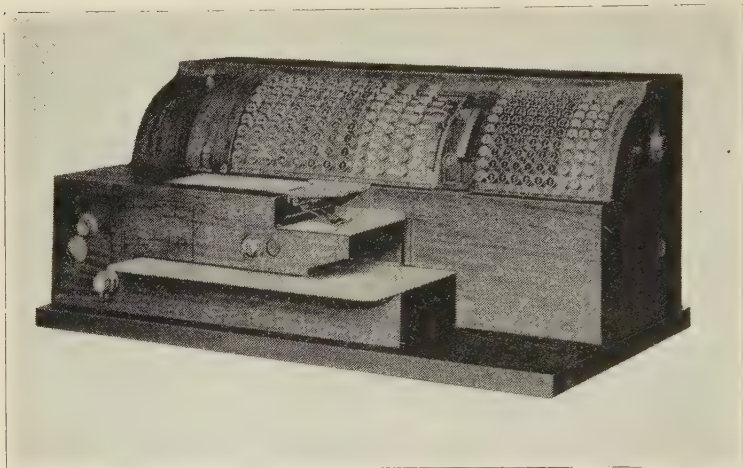


Figure 45: An interesting machine is that pictured above and described on the following page. Of cash register design, it is used for analysis and auditing work rather than for posting.

and accounting machine.¹ As the cards pass through the machines, the quantities are registered in counters which accumulate the totals of the punched information. After the cards of each group have been totaled, an automatically controlled device stops the machine to permit the posting of the figures to report forms and then proceeds with the next group or classification. In addition to the group totals, accumulations or grand totals of all groups can be secured at the same time.

By using a printing accounting and tabulating machine, printed final reports can be secured, with multiple carbon copies, directly from the machine on regular report forms or on plain memorandum paper, fed from a roll, with standard typewriter single or double spacing. The machines reproduced in Figures 46 and 47 illustrate two types of printing tabulators.

¹Made by The Tabulating Machine Company Division of the International Business Machine Corporation.

A third machine (Figure 45) is known as an accounting machine and is used for analysis and auditing work rather than for posting ledgers and statements. It is also used for some classes of bank work.

There is the usual keyboard for amounts to the left, and keys numbered from 1 to 27 accumulate the totals. These keys are to the left of the numeral keys. Each of the 27 keys represents whatever classification the work requires. Any designation may be placed on the plates alongside the keys or on the keys themselves. Distribution of more than 27 classifications is commonly made. Amounts may be analyzed first by major classifications and then in more detail.

Several less commonly used classes may be combined in one total. Distinctive symbols for each classification identify these combined totals. A set of keys to the right of the keyboard prints descriptive numbers or symbols which may be used to further identify each transaction. Ten characters may be printed. This feature is used for recording account numbers, folios, lot numbers, invoice numbers, stock numbers, employees' numbers, part numbers, and so forth.

A continuous record of all operations is made within the machine on the visible audit sheet. It may be used for a permanent record, as a posting medium, or for checking purposes.

A ticket may be issued automatically on all operations or class of operations, or whenever desired. It may be a one-part or a two-part ticket, as the operator wishes. The information printed on both parts of the ticket is the date, serial number, identifying numbers, symbols for the totals used, and the amount. The ticket is used as a voucher, a pay ticket, requisition, posting medium for filing purposes, and in other ways. The same information that appears on the ticket may be printed on any form which is inserted on the printing table.

WHAT ACCOUNTING AND TABULATING EQUIPMENT
DOES FOR BUSINESS

Wherever the classifying and analyzing of statistics or the compiling of reports is part of the daily routine of any business enterprise, there the tabulating machine can be of invaluable service. It is of major importance because it will serve more economically and with greater speed and accuracy than a large clerical force. It removes the possibility of "human error." Today accounting and tabulating machines are recognized as the most dependable means of analyzing such facts as develop in the every-day operation of manufacturing, insurance, transportation, or other businesses. A *partial* list of the industries employing tabulating equipment in their accounting and statistical work will give an idea of the utility of these machines. The list includes:

Public Utilities	Manufacturers
Shipbuilding Companies	Jobbers
Colleges and Universities	Retailers
Motion Picture Companies	Insurance Companies
Iron and Steel Works	Fraternal Organizations
Foundries	Banks
Mines	Cooperative Associations
Refineries	Statisticians
Telephone and Telegraph Companies	Contractors and Builders
Department Stores	Mail-Order Houses
Municipal, State, and Federal Governments	Exporters and Importers
	Industrial Engineers
	Railroads

There is a wide variety of uses to which the machines are put and they cover a large range of reports and analyses. To grasp the significance of the service rendered, it is best to cite a few examples where the machines have been put to the acid test of actual performance and where they achieved results which reacted in establishing their necessity. Take, as an example, the chain store. Here is what one auditor thinks of accounting and tabulating equipment:

"On October, 1, 1922, we were operating 400 grocery and meat stores in Brooklyn and Long Island. In order to systematize the keeping of our inventory, the billing of our stores, and to bring about the accuracy that is essential to good accounting, we installed accounting machines.

"Our equipment consists of three punching machines, one sorting machine, and three tabulators. When goods are received in our warehouse we punch and file cards to give all the required data for each classification of the goods. When we deliver to our stores from the warehouse the cards are withdrawn from the files. Thus, simply by running the remaining cards through the sorting and tabulating machines, we can take an inventory any time we desire it—extended for cost and selling price and totaled for each classification of merchandise.

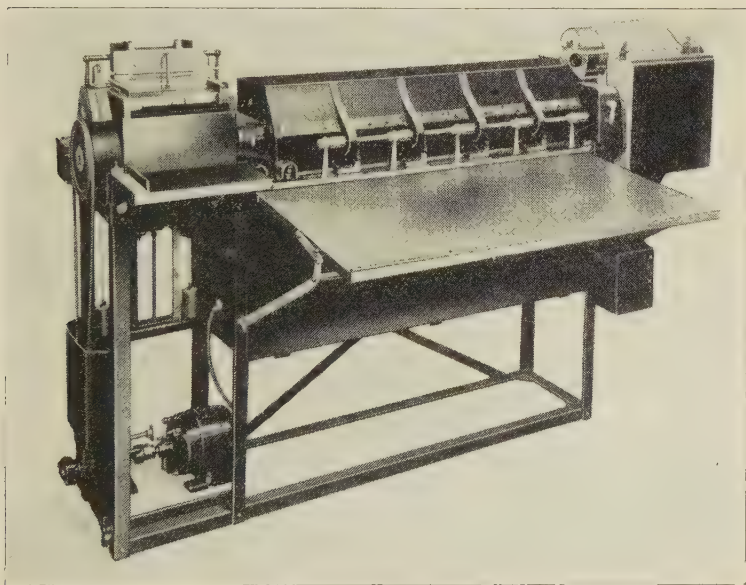


Figure 46: Here is one type of printing tabulator. The contact established through the cards causes the machine to designate and add automatically that which has been perforated into them, listing, totals, or subtotals being obtained, depending on the arrangement desired for reports.

"The cards withdrawn from the files are further used in billing the stores. Upon running them through the tabulating machine, we get a regular invoice in duplicate, showing the number of units, description, weight, retail price, and retail extension of each classification of merchandise delivered. Tabulating equipment enables us to get out four weekly reports consisting of tonnage on all classes of merchandise delivered to and from the warehouse, the total

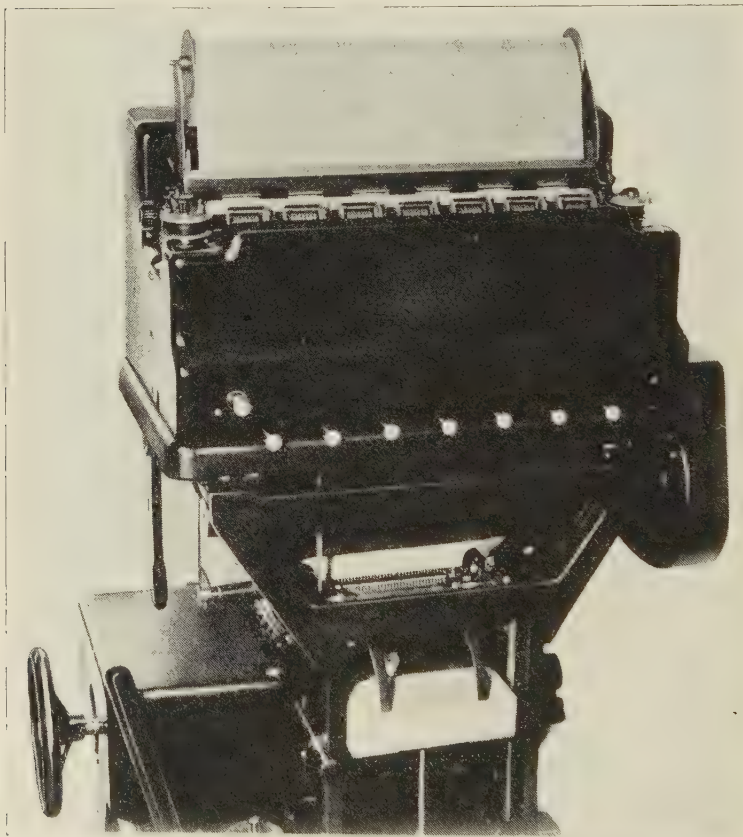


Figure 47: The mechanical type of printing tabulator which prints words, names, and numerals, adds or designates, lists or prints totals only, with facilities for grand totals in one operation.

money value of each of seven classifications of shipments to all stores, the gross profits on each of the seven classes of shipments, and the percentage relation of the value that each class of shipment bears to the total shipment.

"The elimination of errors, especially in billing our stores, is a vital advantage of tabulating equipment, since it saves confusion and time wasted in checking besides promoting better organization and efficient management. We are adding to the work of our equipment as the opportunity arises."

For figuring labor costs the tabulating machine is almost indispensable. One user says: "Practically all our paper boxes and other containers are made up according to customers' specifications. This makes it necessary that we know what it will actually cost to manufacture a special container before we quote a price on it.

"We operate on a weekly basis on account of paying our employees each week. We average 250 factory orders and 7,000 labor cards each week. The equipment gives us satisfactory results for the reason that the majority of our cards are used for several different reports. It is necessary to run the work cards through the machine to obtain a complete statement.

"We also use this equipment for our sales report and distribution of cost for our machine-shop. Sales cards, machine-shop cards, and a few other miscellaneous items amount to about 3,000 cards per week.

"Tabulating our labor costs by hand would, of course, be impractical as it would require at least six more people, with an additional salary expense of \$600 a month. On this basis the machine is paying for itself every week."

The field of service for accounting and tabulating machines is not limited to large enterprises alone. They are adaptable to the needs of all classes of business, large or small, and the method of using them is so flexible that they will compile, distribute, or analyze any kind of information. Through their use adverse conditions may be noted and checked before it is too late to rectify them.

X

CHECK PROTECTORS AND WRITERS

Every business needs check protection. Early attempts to protect checks. Three important features of check writers: protection; characters written; how written. How special features are combined: amount and payee's name protector; removable-type protector; general utility check writer; numeral-imprint and payee protector; diagonal-amount-line check writer; foreign-language check writer; two-color amount-line check writer; personal check protectors. The value of the check protector is inestimable.

THE need for check protectors becomes apparent when one realizes that over six billion checks and drafts are used annually in the United States, and that each of these checks and drafts introduces the problem of providing "adequate protection" against the forger. So valuable is the service and so extensive the field of operation of this service, that there is scarcely a business enterprise today—ranging from the small retail store to the large industrial plant—that does not utilize one or another of the many kinds of check protectors and writers now on the market. In addition to this service of safeguarding against financial losses, these machines are time- and labor-saving devices. They can be used to great advantage, for instance, in making up the pay-roll checks for large business organizations, as they assure accuracy, and work more quickly than any human agents. Figure 48 illustrates a check writer in use.

Indirectly, the invention of check protectors arises out of the development of bank exchange and its substitution for currency in financial dealings; for the advent of paper money on the scene was also the cue for the forger's entrance. He played his part with great success for a long time, but little by little he has "lost his lines" by reason of the effectual check protector. Because of this parallelism of growth, the several steps in the evolution of the personal

check are traced along with the various attempts at its protection.

It is not impossible that an erudite historian might prove that checks and similar instruments were used as long ago as the days when King Solomon paid the household bills of his 700 wives. Charles A. Conant speaks¹ of a system of commercial instruments, including "transfer checks," as being used by the Assyrians at least seven centuries before Christ. He adds, however, that "even if the check can justly lay claim to remote antiquity in origin, its extensive use is a development strictly of modern times." The transfer checks spoken of were inscribed on small clay tablets and baked into bricks for preservation.

Then, too, Italian bankers are frequently spoken of as "inventing" the check, but such instruments as the Florentine bankers, the Dutch, and the goldsmiths of early London used were ponderous documents in comparison with the flexible little "pay to the order of" of today.

The first organized system for clearing "country" checks was established in London in 1853. Up to that year there was no recognized method of handling these country checks except directly from the issuer to his creditor and from the latter to the particular bank on which it was drawn. In New York, up to 1858, it was the custom for messengers and clerks from several banks to meet daily at a certain corner in Wall Street to exchange notes and other items. Out of this group grew the New York Clearing-House of today. It was organized in November, 1853, at a meeting attended by the representatives of 52 local banks. Boston and Philadelphia followed suit by organizing their own clearing offices in 1856, and Chicago in 1865. That was the start of the present-day system for the exchange of checks between banks within a city, without shipping actual currency, except in settlement of balances. Fairly rapidly the exchange of bank checks was established, but it is only within comparatively

¹In *A History of Modern Banks of Issue*.

recent years that a merchant, say, in Iowa or Tennessee, has felt free to make remittance to his creditor in New York by personal check.

In Continental Europe it is only since the World War that the use of checks by private individuals or by business concerns has made any considerable headway, and it is still the custom of many commercial houses in France, Germany, and neighboring countries to keep on hand a bulky supply of gold coin against the monthly "settlement day."

EARLY ATTEMPTS TO PROTECT CHECKS

Pioneer bank-notes, as they first came from the press, were of very simple design—so simple, in fact, that they seemed to invite forgery. The fact that no denomination



Figure 48: A check protector is a necessity for the small, as well as for the large, business. Every check a business issues should be protected. Writing one check or quantities of checks with a mechanical check writer effects a great saving of time as well as of labor.

less than a five-pound note was printed in the beginning was discouraging to the "scratcher," who would have aroused suspicion had he possessed more than that amount. But the year 1760 found one-pound and two-pound notes current

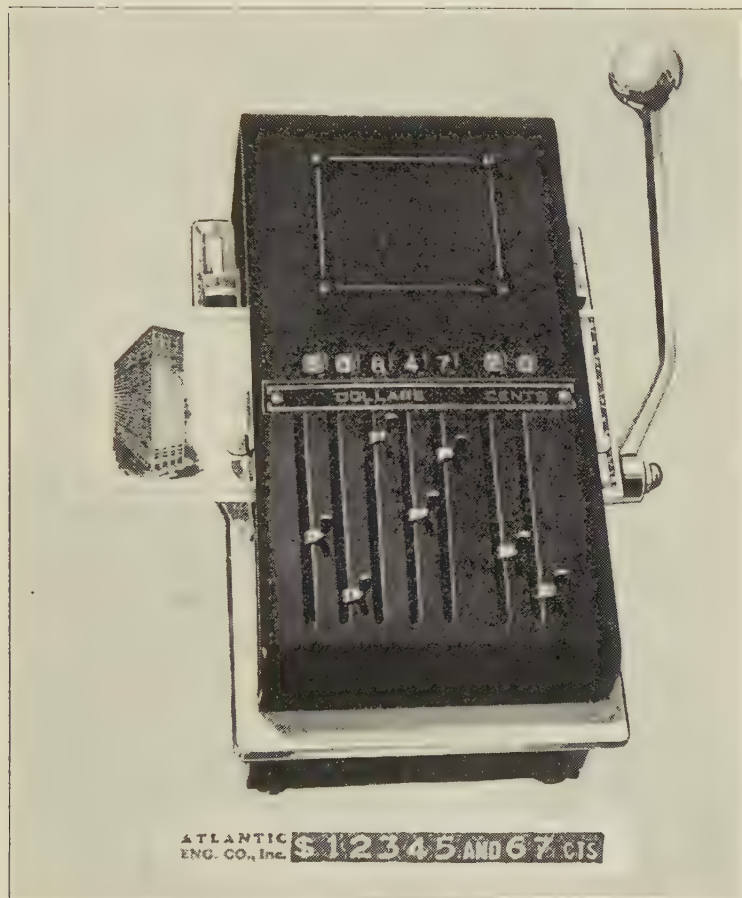


Figure 49: The amount is written and the payee's name "crimped" when this type of check writer is used. This type of machine is equipped with a repeat device which enables the user to segregate checks for similar amounts without any changes in the set-up of the amount. For further description, see page 192.

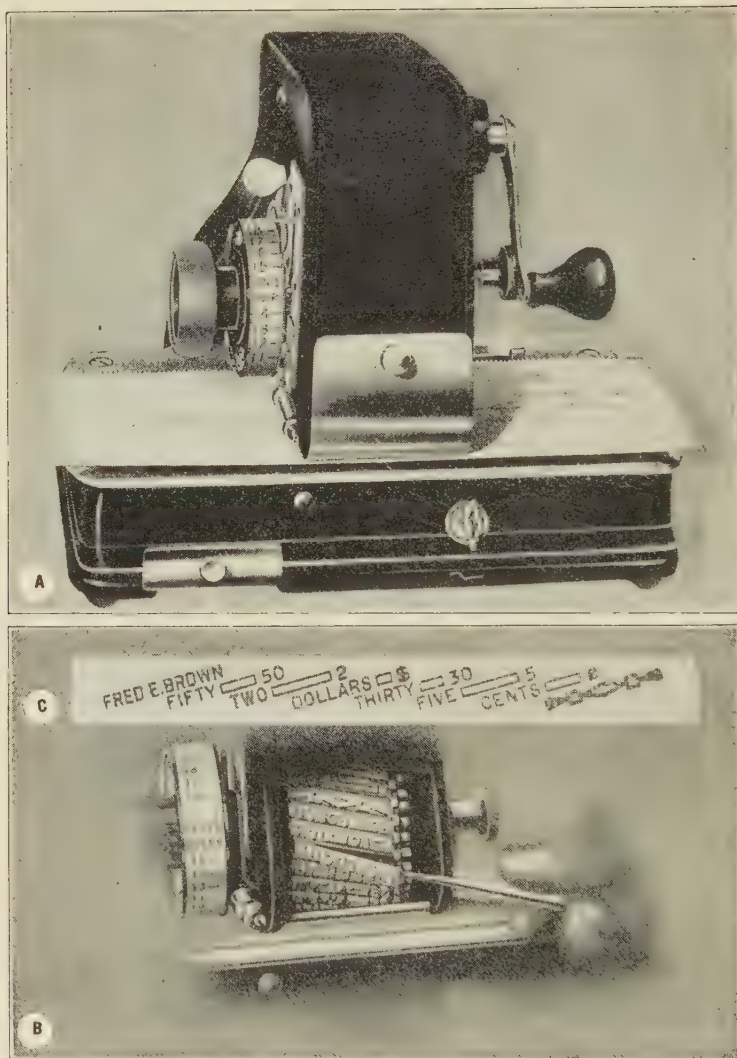


Figure 50: The check writer shown in illustration A has the unique feature of removable type as revealed by illustration B. This feature eliminates difficulties consequent upon worn-out type as new type-bars can be inserted at will. An impression of the writer is shown in illustration C. For full details see page 192.

in England and the crime of forgery quite as common. It has been recorded that by the end of the eighteenth century, as many as 352 persons were convicted, in a single year, of "raising" and forging Bank of England notes.

An early history of Connecticut mentions that the "Nutmeg State" was the scene of activity for the first "raiser" in the American Colonies. Abel Bueble, a native of Killingworth, Connecticut, was apprenticed to a gold- and silversmith and before he was 20 years of age was detected "raising" a five-shilling colonial note to five pounds. He was imprisoned at Norwich and his forehead branded with a letter "C."¹

The practice of issuing bank drafts, postal money orders, and the like, for remittance by post, was a development of the nineteenth century. Forgers immediately took advantage of this opportunity for thievery. This field attracted the type of thieves who had a leaning toward "Raffles" methods. It was so simple to step in a bank and purchase a draft on a New York or Boston correspondent for \$5. The original amount was then washed off with acid, \$5,000 put in its place, and the draft carried to the city where it was payable. Thus a profit of several thousand per cent was made, with no difficult work. Later on, these drafts were made out on special papers, sensitized to moisture and acids, but this did not insure the check against what is known as "penning"—adding a letter and several numerals. That is, there is no special paper or acid-proof writing ink that can prevent the words "Eight Thousand," written in longhand, being changed to "Eighty Thousand" by merely adding the letter "y." Experts have always agreed, however, in urging the use of sensitized papers in conjunction with adequate mechanical protection.

The patent office records show the first form of mechanical protection to have been a "check puncher," patented in 1870. For a time it was thought this device would put

¹See *Connecticut as a Colony and State or one of the Original Thirteen*, by Morgan E. Forest.

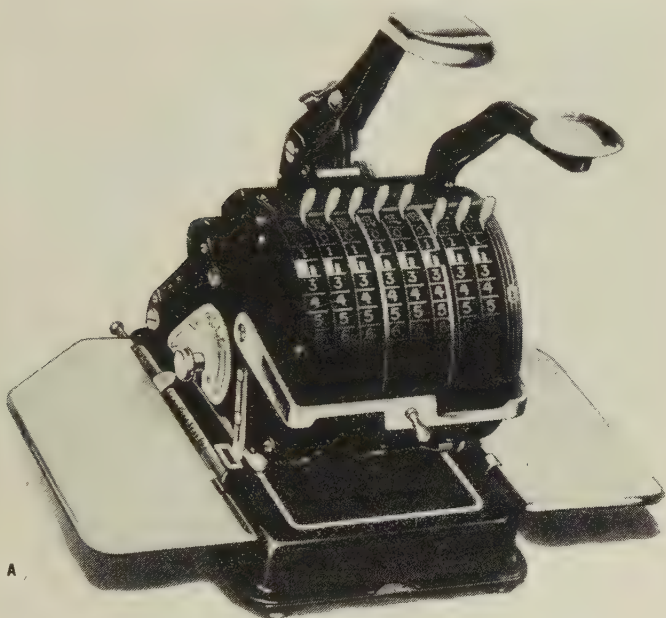
the forgers out of business, but that was not to be accomplished with a puncher. Soon the master "scratchers" discovered that anything which is punched or cut out of pieces of paper can be restored. The check raisers secured punchers of their own, took the little disks or punching thrown out of the draft by the machine, and put them in place to fill up the first or last ciphers, thus multiplying the draft many times its value. Moreover, the banks, feeling secure in their use of these punchers, allowed their guard to drop temporarily, and immediately came a flood of raised drafts that were cashed by banks from one end of the country to the other.

The records of the patent office, beginning with the year 1837 and up to 1900, are filled with the claims of ambitious



Figure 51: The check protector shown above writes in words and numerals as illustrated in the insert. The words and figures are set up in two fast movements and are imprinted at a single stroke. Any size check can be used. See page 194.

inventors who sought to prevent this. Among these inventions were countless special forms and tinted blanks; secret designs in paper; tinfoil and carbon strips inserted between the leaves of paper cemented together; punch-and-die machines; cipher and "advice" systems.



MARSHALL FIELD & CO. \$529 AND 65 CTS

THE SUM OF \$529 AND 65 CTS

Figure 52: The check writer shown in illustration A writes the amounts in Arabic numerals as illustrated by the imprints shown in C. This check writer also crimps over the payee's name as shown in B. Other interesting features are described on page 194.

This last-mentioned—the letter-of-advice idea—did find some favor with the banks, following the failure of the figure punchers. This system consisted in sending daily to each correspondent bank a letter giving the serial number, amount, and payee's name of each draft issued against it for the day. Checkmated in this field, the draft-raiser quite naturally became a check-raiser, operating with private checks obtained in numberless ways.

The first mention of "cheque" is found in the English records about the year 1781, when English bankers began using what we now refer to as "checks," bound in books, but more commonly synonymous with draft as meaning a written order on a banker. Eventually, it acquired its present meaning and has a statutory definition of its own—"A bill of exchange drawn on a banker on demand."

One of the earliest models of check protectors introduced

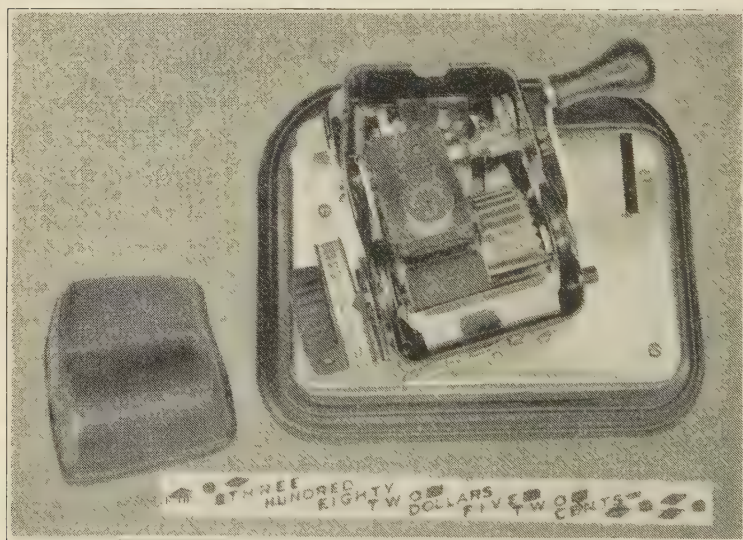


Figure 53: In one mechanical operation the above check-writing device protects the payee's name, writes the amount diagonally, and feeds the ink into the roller, distributing it over the type evenly. The style of writing is revealed in the insert. For other features, see page 195.

the fundamental principle of forcing into the paper the words representing the amount, making them part of the fiber.¹ The first machine operating on this principle was fitted together in 1899. This early model was equipped with copper type and rubber plate, which embossed the approximate amount of a draft into the paper, using black ink, in the form of a "Not Over" or limiting line. The rubber-platen machine was supplanted by one with a steel platen in 1904. The succeeding years, up until 1913, were experimental variations on the "shredding principles." The result was the perfecting of a check-writing machine built with scientific precision, shredding the amount of checks, drafts, and stock certificates, trade acceptances, bills of lading or letters of credit, and so forth.

In 1914 a figure-writing check writer was placed on the market.² This machine printed the amount line of a check in figures, stamping the imprint through the paper of the check. The feature of visibility, the Arabic numeral imprint, incorporation of firm name or trade-mark in the amount-line imprint, and speed of operation were the distinctive characteristics of this machine.

In 1917 a new model appeared on the market³ which had, as outstanding features, the diagonal writing and the revolving type cylinder, which consisted of a type cylinder and perforation over the payee's name. This machine was the first check-writer on the market that crimped the name mechanically and wrote diagonally.

In 1919 a check protector which printed the amount in numerals, and which, at the same time, perforated an uninked design over the payee's name, appeared on the market.⁴

In the same year, Burgess Smith—a man to whom a great

¹Manufactured by such companies as The Todd Company.

²Manufactured by such companies as Hedman Manufacturing Company.

³Manufactured by such companies as Hedman Manufacturing Company and Safe-Guard Check Writer Company, Incorporated.

⁴Manufactured by such companies as Checkometer Sales Company.

deal of credit is due—undertook the development of check paper which would be unalterable. After several years of experimentation Mr. Smith procured a paper design that cannot be duplicated. The design of each check is built layer upon layer. The foundation principle is a cluster of dots, meaninglessly casual, but actually arranged according to a mathematical formula—utmost precision in the spacing of these primary dots, and of the following “repeat operations,” resulting in a paper not to be imitated. Several of these patterns were developed by Mr. Smith, and it is extremely difficult to obtain any pattern a second time.

It should be understood, however, that safety paper alone does not prevent check-raising, because by the pen-change method almost any amount can be raised without the need of an erasure of any kind. In conjunction with a check writer, however, it offers a very high quality of protection.

THREE IMPORTANT FEATURES OF CHECK WRITERS

So rigidly are all check-protective patents enforced that each particular make of machine is placed in a special category. There are, however, three features which all types of check protectors and writers share in common. These are: first, the protection they afford—the degree and kind; second, the characters they write—words or numerals; third, how they write these characters.

Protection. All makes and models of check protectors and writers are primarily designed to protect the amount; three makes protect the payee's name also.¹ The check writer enforces its protection in three ways:² (*a*) by shredding; (*b*) by printing; and (*c*) by perforating and embossing.

¹Manufactured by such companies as Checkometer Sales Company; Hedman Manufacturing Company; Safe-Guard Check Writer Company, Incorporated.

²Manufactured by such companies as Checkometer Sales Company; De-fiance Manufacturing Corporation; Hedman Manufacturing Company; Safe-Guard Check Writer Company, Incorporated; The Todd Company.

Characters Written. The check-writer manufacturers design machines which write amounts in four different ways; namely: first, the exact amount in words;¹ second, in numerals only;² third, in words or numerals;³ fourth, both words and numerals.⁴

How Written. These characters can be written one at a time, the type being inked as each character is set up. The whole amount may be written in one operation and likewise inked as set up; the type may also be inked for repeated amounts. Some of these makes of check writers allow a visibility of the whole set-up before printing.⁵

HOW SPECIAL FEATURES ARE COMBINED

All check protectors and writers on the market have been designed with the specific purpose in mind of serving for the work of check protection in the *most efficient manner possible*. For this reason each has been equipped with special features. In order to do justice to the many machines on the market, the various types will be taken up individually in the following paragraphs and the outstanding mechanical features with which they are equipped will be explained.

*Amount and Payee's Name Protector.*⁶ The device designed to protect both the amount and the payee's name operates by means of small, "pinhole" perforations which

¹Manufactured by such companies as Defiance Manufacturing Corporation; Safe-Guard Check Writer Company, Incorporated; The Todd Company.

²Manufactured by such companies as Checkometer Sales Company; Hedman Manufacturing Company; and The Todd Company.

³Manufactured by such companies as Defiance Manufacturing Corporation; Hall-Welter Company, Incorporated; and The Todd Company.

⁴Manufactured by such companies as Defiance Manufacturing Corporation.

⁵Manufactured by such companies as Defiance Manufacturing Corporation; Checkometer Sales Company; and Hedman Manufacturing Company.

⁶Manufactured by such companies as Checkometer Sales Company.

imprint the amount in figures. These perforations are made by forcing sharp dies through the paper, and the type forces the ink into the perforations. The pinholes, however, which are die-cut on the payee's line, are not inked. The "dollar and cents" levers move back and forth in their respective slots, and are brought to a halt when the desired figure is registered in the open dial directly above the "run way" of each lever. Once the machine is set, any number of checks may be written for that amount. This feature, especially in the electric models, makes for great speed in certain types of work. The repeat feature enables the operator to segregate checks for similar amounts and stamp them simultaneously without any change in the set-up of the amount (see Figure 49).

When the check is inserted, the amount line is brought into position, where it remains set, leaving the operator free to set the desired amount with both hands. When the amount to be printed has been set up in the machine, one complete movement of the lever prints the entire amount line. As the lever is moved forward, pin-like perforations are made in the amount line and pay-to-the-order line of the check, and as the handle is returned to place, the amount line is imprinted with the ink.

*Removable-Type Protector.*¹ The type-wheel on this check protector has interchangeable and removable type characters (see illustrations A and B of Figure 50). This unique feature—when type characters can be replaced—eliminates the difficulties which arise from using worn-out type and also makes it flexible for a wide variety of uses. Any special type bars may be secured from the manufacturer, expressing words pertinent to any particular business, and these may be substituted for other characters in the machine. For example, the machine is readily adapted for the writing of warehouse receipts, in that there can be in-

¹Manufactured by such companies as Hall-Welter Company, Incorporated.

serted bars expressing various items for which warehouse receipts are given. A check may be inserted in this machine from almost any position or angle. It immediately lines itself up with the gage which has previously been set for the printing line. The dial wheel is then turned to the various characters required and the operating handle turned after each character, which completes the writing function.

An additional feature of this machine is that it is equipped with the individual name of the purchaser who instructs his bank to honor only such of his checks as are drawn with his name preceding the amount line as a mechanical counter signature. Illustration C, in Figure 50, pictures how the name preceding the amount, first in words, then followed by numerals, is written in diagonal lines. By notifying the banks to pay only such checks, a certain amount of protection is obtained. To prevent the unauthorized or illegal use of this machine, it is equipped with a pick-proof and skeleton-key-proof lock. This machine writes in both words and figures.

*General Utility Protector.*¹ The general utility check writer prints the exact amount in words and numerals in one operation and in a straight line. The words and figures are set up in three fast, easy movements and are imprinted at a single stroke. This particular machine is used to advantage for pay-roll work. The amount in words and in figures must always agree. This is advantageous in pay-roll or dividend work where, in checking back, only the numerals need be watched. A specially prepared "acid-proof" ink is used for inking the type for whole amounts and for repeated amounts. As the amount is set up, the process is visible to the operator; that is, single characters before printing, the whole amount before and after printing, and the set-up retained for repeated amounts are visible.

One model especially built for the public utility compa-

¹Manufactured by such companies as Defiance Manufacturing Corporation.

nies has a capacity of 100 to 400 type lines—each line showing gross, discount, and net amounts. Any size bill can be used and the imprint can be placed anywhere on the form (see Figure 51). The dial wheel is arranged for instant sighting, and one stroke of the lever stamps the bill.

*Numeral Imprint and Payee Protector.*¹ The typical feature of this check writer is its numeral imprint. It is a pioneer figure-writing check writer, and shreds-in the amount line in one downward pressure of the operating lever. It also crimps the payee's name, no matter where this may appear on certain forms of checks. The particular amount line which is to be written shows in a window-opening in the face plate of the machine, as shown in illustration A of Figure 52.

Once the finding tabs are set for any particular amount, this amount may be repeatedly written by the operator. Banks have found this feature of great advantage when writing their Christmas club checks for \$25, \$50, \$75, and \$100 amounts. This feature is also of great advantage for making out pay-roll checks. A foot-power or electric model may be used to speed up the writing of checks to a speed approximating 500 checks or more an hour.

The various imprints made by this machine are shown in the group of illustrations in Figures 52 and 54. The regular imprint is shown by illustration C of Figure 52. The machine, however, may be equipped with a die which imprints the name or trade-mark of a concern with the amount as shown in illustration B. This helps identify the drawer's checks to his banker, guards against forgery, and gives the user insurance-policy protection against forgery. A third style of imprint is the incorporation of the serial number of the machine in the imprint. For all practical purposes this makes an imprint as individually the drawer's as his name or trade-mark would be, since the serial number of the machine

¹ Manufactured by such companies as Hedman Manufacturing Company.

is registered in his name and gives him insurance-policy protection against forgery. Many firms with branch offices widely scattered use the serial number imprint feature in machine as a means of instantly identifying checks drawn by one of the other branches, thus expediting inner-organization accounting. This machine may also be used for foreign currencies.

To operate this numeral-imprint check writer the check is inserted in the front of the machine, and is held in position by fixed guides. The finding tabs are moved to present the required amount in a visible line in the window-opening of the face plate. To write, say, \$529.65, the five finding tabs would be moved in the five slots, and 52965 would show in the window-opening. The operating lever, being forced down, imprints the amount. All other parts of the imprint-line register and print automatically without any extra operation on the part of the operator.

*Diagonal-Amount-Line Check Writer.*¹ The chief characteristic of this check-writing machine is that the diagonal amount line is written out in full. Few amounts are too large to get in one line. A second characteristic is the shredded line in which the payee's name is written. Thus, the diagonal writing and the shredded writing give two forms of protection (see Figure 53).

The machine pictured in Figure 53 on page 188 is mounted diagonally on a light-weight metal platform about 9 inches square. Two adjustable levers on the platform line the check up to feed straight into the machine. On the right of the device is the operating handle which must be moved forward and back as each word is turned into place beneath the indicator. This indicator is merely a metal finger placed above the center of the "figure" wheel. The number moved to a position directly beneath the finger will be registered on the check. The machine is equipped

¹Manufactured by such companies as Safe-Guard Check Writer Company, Incorporated.

with a patented ink reservoir which automatically feeds the ink to an ink roll, and a stub brush is used for distributing the ink over the revolving figure drum which is actuated by the handle mechanism which spreads an indelible red acid-proof ink in the amount line.

*Foreign-Language Check Writer.*¹ Another interesting development by the manufacturers is a check writer with many combinations of foreign denominations for use in foreign banking. This device writes in the respective languages of the countries where it is used (see Figure 54). Recently, one was placed upon the market for use in Japan—operating in the Japanese language. This device² is equipped with an automatic ink reservoir which positively functions and feeds ink to the ink roll only when the ink is desired and when the machine is in operation. It is interesting to note that the ink is not fed when the machine is not being operated. This patented ink reservoir is a very novel and ingenious device.

When inserting the check, the guides are first adjusted to the amount line in all cases except when writing vouchers. On the latter model the guides are not found, as the voucher is fed into the machine from the back. The complete movement of this handle presses the type against the red-ink roll, actuates a brush that distributes the ink evenly over the type, shreds the amount line in red ink, and cuts, in the same fashion, the payee's name. The pressing of the type against the ink roll, together with the use of the brush for the distribution of the ink, brings the ink reservoir into play to feed the ink. Shredding the amount line and the payee's name is done in one operation.

There is a check protector and writer³ which can be

¹Manufactured by such companies as Hedman Manufacturing Company; Safe-Guard Check Writer Company, Incorporated; and The Todd Company.

²Manufactured by such companies as Safe-Guard Check Writer Company, Incorporated.

³Manufactured by such companies as Hall-Welter Company, Incorporated; Hedman Manufacturing Company; and The Todd Company.

equipped to conform to the monetary standards of coinage and language of every country in the world. There are also various other models on the market which may be used in foreign countries, some of which write all languages combined on one machine.

*Two-Color Amount-Line Check Writer.*¹ For added protection, this device writes the amount line in two colors—the actual amount in red, the denominations in black. All models are adapted to a wide range of checks and other documents. In fact, any width document can be used. The depth of the document is limited by the size of the writing space of the machines.

There are several models of this same general type. One imprints and shreds the amount line in figures or in words and figures, accomplishing this two words at a time; for instance, the words “nine hundred” are printed simultaneously beneath each other. This model gives added protection wherever figures are used in check writing—the figures being spaced in accordance with their width. For example, much less space is allowed for the figure “1” than for the figure “8.”

To place a check in this machine, the indicator must be in the center of the release sign and the operating handle straight down. This indicator, as can be seen from illustration A of Figure 55, has a dual movement, longitudinal and lateral.

The check is placed on a shelf at the right side of the machine with guide stops which line the check up before it is fed into the machine.

Another model of this type is practically the same in appearance as the model just described. This machine writes only one word at a time in small condensed type, and the words “Dollars and Cents” appear three times to increase speed.

¹Manufactured by such companies as The Todd Company.

The electric model is equipped with an automatic check ejector as well as stop buttons for selecting the words "Dollars," "Cents," and "No cents." When the indicator is moved longitudinally over the dial plate, the type carrier engages the stops at these much-used words, thus greatly increasing the speed of operation. A special, silent worm-gear drive connects the motor to the check writer, and is quickly adjustable for any speed. The hand crank may be attached in case of emergencies.

The initial turn of the operating handle automatically moves the indicator to the word "Exactly," which is shredded in black ink at the beginning of the amount line. The indicator is then moved to the desired word or compound of words on the dial, and the operating crank turned once for each position. The check is fed through the machine between the circumferentially grooved type cylinder, and the cooperating grooved platen. The paper is thereby uniformly shredded at the same time the ink is thoroughly applied. The type cylinder is inked during its revo-

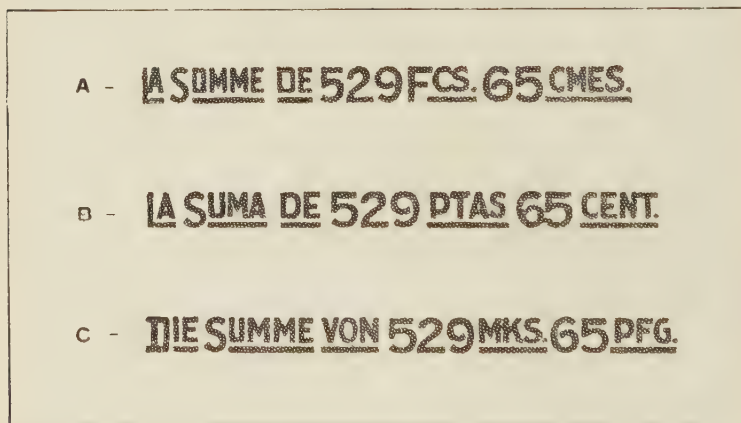


Figure 54: This illustration demonstrates how one type of foreign-language check writer conforms to the monetary standards of coinage and language of three countries. The impressions illustrate how the amount may be written in French (A), Spanish (B), and German (C). A detailed description of these check writers is given on page 196.

lution by contact with a series of ink rolls. This machine is constructed so that the top of the case may be lifted to facilitate the cleaning of the type and also to permit inspection of checks at any time during the writing. These machines also have removable ink rolls in two colors, and an automatic check release and detachable operating crank. Figure 55, below, pictures the two-color amount-line machines just described.

Machines are also built for use by public utility companies, in preparing bills showing gross, discount, and net amounts, in order to prevent fraudulent alterations. The bill is inserted in a slot in the machine, a knob is turned to

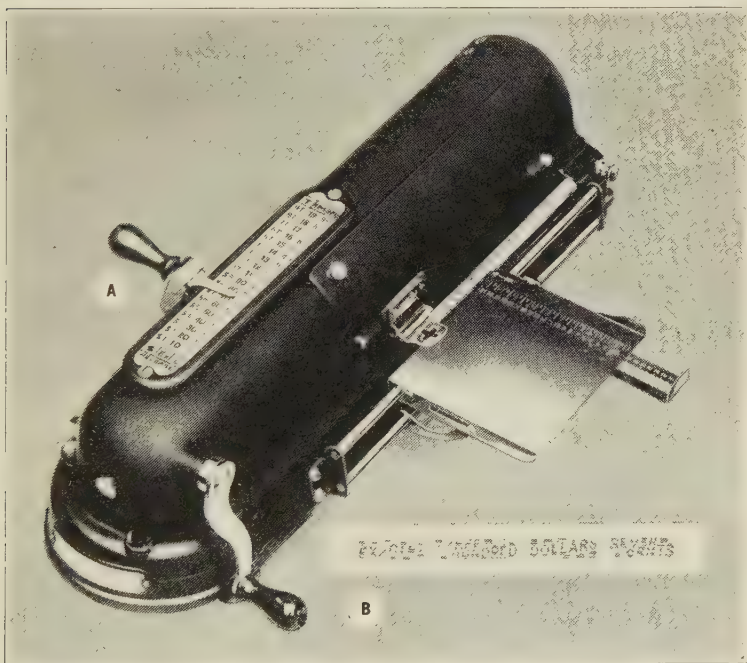


Figure 55: When a check is inserted in the check writer presented above, the amount line is written in two colors—the actual amounts in red, the word denominations in black. Illustration B shows one style of writing; see page 197 for a description of other styles.

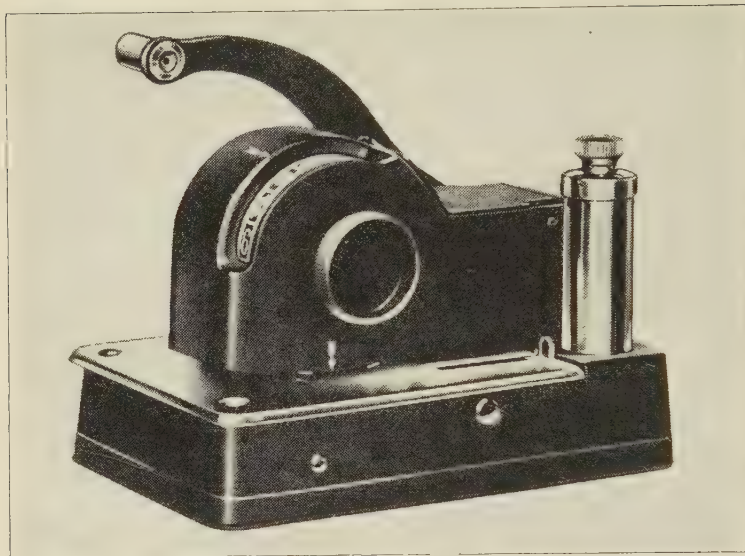


Figure 56: The above illustration shows a model of a check protector especially designed for personal, rather than business, use. The amount is shredded as on office models, in one color. An ample ink pad permits extended use without re-inking.

select the amount desired, and then a lever above the machine is depressed, printing the three amounts simultaneously.

*Personal Check Protectors.*¹ No description of check protectors would be complete without some mention being made of the personal model now available. Designed to provide busy men and women with the same protection for their checks as banks and business houses demand, this type will unquestionably fill a long-felt need. One model of this type is shown in Figure 56, above. The amount line is shredded in one color. The model shown is equipped with an automatic feed, and the ink pad permits extended use without re-inking.

¹Manufactured by such companies as The Todd Company.

THE VALUE OF THE CHECK PROTECTOR IS INESTIMABLE

Every user of a check protector and writer is seeking primarily for security and, as a latter-day development, for speed. The check-writing device protects, as far as is mechanically possible, the banker and his depositor against the raised and forged checks. There is no absolute protection of every part of a check, but certainly the present-day check protector and safety paper have gone far in this direction, since many manufacturers of these machines have taken the added precaution of reenforcing their undoubted protective and anti-forgery features by the issuance of insurance policies. These, issued by well-known insurance companies and registered in the name of the original purchaser of the check writer, offer coverage and protection often as high as \$10,000 a policy. They have been a large factor in establishing in the mind of the check-writer user a sense of security and protection against loss—which is of material business aid to himself and his banker. The policies cover such details as loss through alteration of the amount, payee, date, and number of a check.

Considering the check writer from the ever-widening and desirable angle of speedy operation, its use is equally important. Companies issuing pay-roll checks in large quantities, banks and establishments periodically issuing dividend checks—all of these have found that an efficient check-writing machine enables them to spare clerical assistants for other necessary tasks, while at the same time the work of those engaged in preparing the checks is lightened.

XI

CHECK CERTIFIERS, ENDORSERS, CANCELERS, AND SIGNERS

Need for such equipment. Check certifiers. Check endorsers: single feed endorsers; quantity feed endorsers. Check cancelers. Signature-writing devices. These appliances save money.

IN connection with check protectors and writers it seems feasible to take up other devices whose development was prompted by the use of checks as a medium of exchange. The equipment of a bank or of a large business house is considered incomplete without the several machines described here—check certifiers and endorsers, cancelation machines, and signature devices.

CHECK CERTIFIERS¹

Check certifiers provide a safe and convenient means for the certification or acceptance of checks.

Figure 57 illustrates a device which prints a form of acceptance or endorsement by means of a die in a printing head. The style of the acceptance can be arranged to conform to individual cases in form, design, or wording. The die hitting against a hard rubber base makes the endorsement, through a ribbon, on the check which has been placed under the printing head. As each certification is printed, the ribbon moves a certain distance so that a fresh part is brought under the die.

By means of a numbering device, which is shown in the illustration on the following page, each check is given a

¹For further information, consult such companies as A. D. Joslin Manufacturing Company; The Roberts Numbering Machine Company.

serial number as it is certified. Such a numbering system greatly simplifies the work of recording transactions, of checking or tracing a previous day's entry; it also affords a check against all records, and offers additional protection. To prevent unauthorized tampering or numbering, a lock is provided.

Another certifier is somewhat different, in that the data are imprinted from steel wheels and a flat die. A felt pad provides the ink for the impressions. This certifier operates either automatically or by a lever, and the actions are consecutive, duplicate, and repeat. What particular model

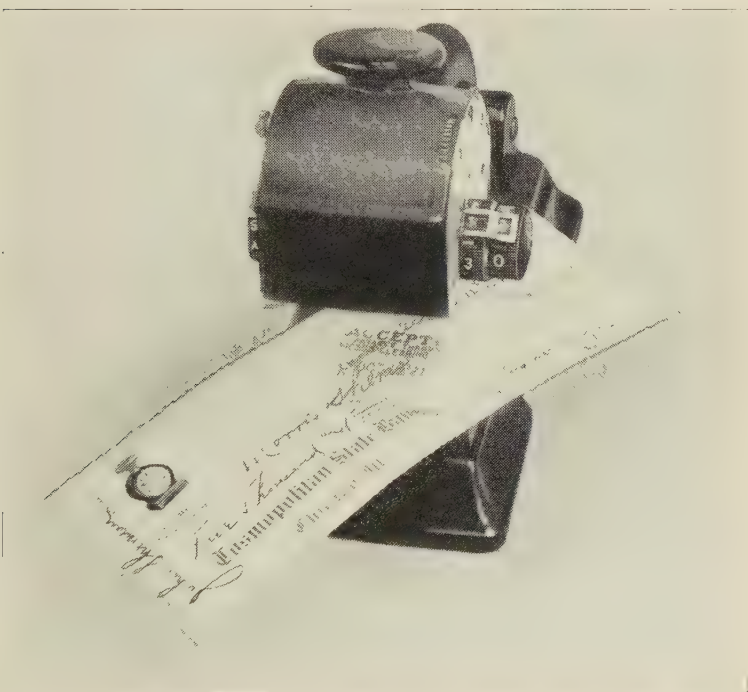


Figure 57: All banks use check certifiers for printing a form of acceptance on checks. This one imprints through a ribbon which moves a certain distance as each certification is printed, so that a fresh part of the ribbon is automatically brought under the die. A numbering device gives each check a serial number. For a detailed description of this certifier, read page 202.

will best fit your needs depends on what you believe will handle your work most satisfactorily.

CHECK ENDORSERS

Every clearing-house and transit check handled by a bank or a business house must be marked either with the deposit endorsement or the transit or clearing-house endorsement. Formerly these endorsements were made with hand rubber stamps, whose impressions were often illegible. This slow process has now been replaced by motor-driven devices which automatically endorse checks very speedily.

The means of making the impression is a metal or rubber die with movable type for dates and batch numbers. Printing is done from ink distributed to the die by rollers. All models are electrically operated.

A device on one machine straightens out checks which have been dropped in on the slant so that the endorsement is made parallel to the body of the check.

Two facsimile endorsements are shown in Figure 58.

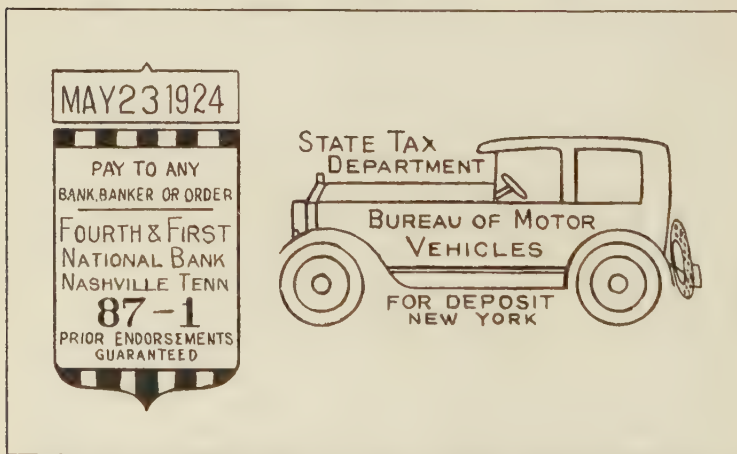


Figure 58: Endorsements made by the old hand rubber stamp were not readable like the ones shown here. How slow, too, was the process of marking each check with the clearing-house, transit, or deposit endorsement as compared with the machine method now in use.

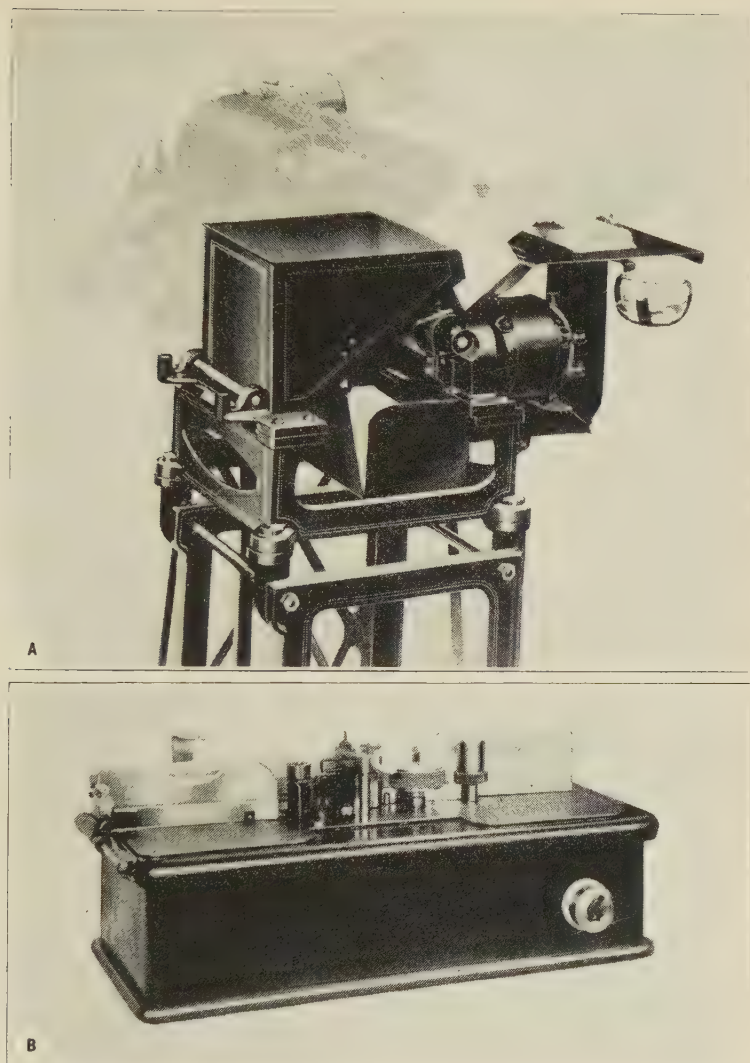


Figure 59: Another time and money saver for banks and large commercial houses is the check endorser. A single feed model can be used in conjunction with an adding machine so as to endorse the checks at the same time they are listed, as explained on page 206. Such a machine is pictured in A, above; B is a quantity feed model. Both are motor-driven.

There are two kinds of endorsers: single and automatic quantity feed.

*Single Feed Endorsers.*¹ An adding machine used in conjunction with a single feed endorser makes it possible to list checks for either clearing-house, transit, or deposit and endorse them at the same handling, as demonstrated in A of Figure 59. The operator lists the amount of the check on the adding machine, then turns the check over and drops it into the endorser which puts on the endorsement and stacks it in proper order in the tray. The endorsement may also be made in connection with and at the same time as any other necessary handling—scanning, comparing, or entering. Further, one model² is now used by many large companies for the signing of pay-roll checks.

*Quantity Feed Endorsers.*³ The machine pictured in illustration B of Figure 59 will endorse over 200 checks a minute and stack them in their original order. The operator places several checks at a time into the feed device. By means of this device, which is a revolving friction roller, and by means of the pressure brought to bear on the checks by a spring, one check at a time is fed into the machine. This endorser is equipped with a 1/12-horse-power motor.

A smaller quantity feed machine (not illustrated) has a capacity of 150 checks a minute. It is equipped with a self-contained 1/30-horse-power motor.

CHECK CANCELERS⁴

Annoyance or loss due to the presentation for payment of checks already paid is not uncommon—that is, when a

¹Made by such companies as The American Perforator Company; Cummins Perforator Company; The International Postal Supply Company of New York.

²Manufactured by such companies as The American Perforator Company.

³Made by such companies as The International Postal Supply Company of New York.

⁴Manufactured by such companies as The American Perforator Company and Cummins Perforator Company.

rubber stamp is used for cancellation. Intentional criminal erasure and the erasing or fading action of time and weather on rubber-stamp die can be guarded against only by perforating the cancellation through the check.

Devices known as check cancelers offer such protection to checks, notes, mortgages, and the like. They give an enduring and inerasable evidence that the check has been paid, and show the exact date of payment. In addition, the bank's A.B.A. number may be perforated, thus definitely identifying the bank (see Figure 61).

Perforations are made by means of punches and dies. Levers set the dies in position for the right month, day, and year.

Figure 60 shows a hand-operated model which works at a

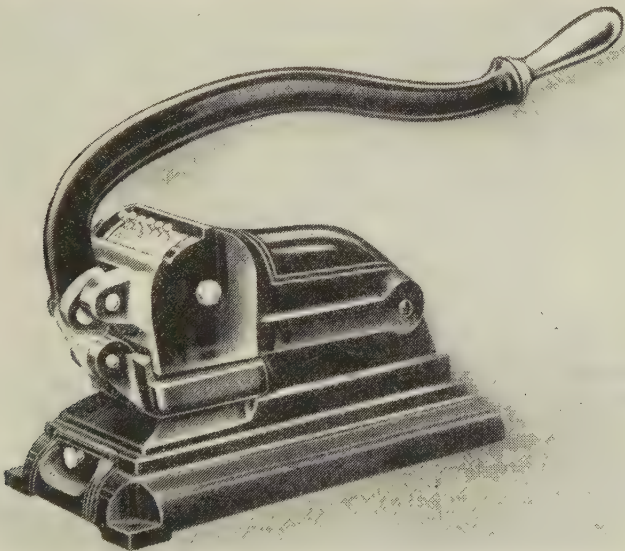


Figure 60: Safe and proper cancellation of checks must give enduring evidence that they have been "paid"; clearly establish the time of payment; and definitely identify the bank. Machines like this one are widely used because their cancellation, perforated through the check, gives such protection.

Other uses of the devices are enumerated on page 208.

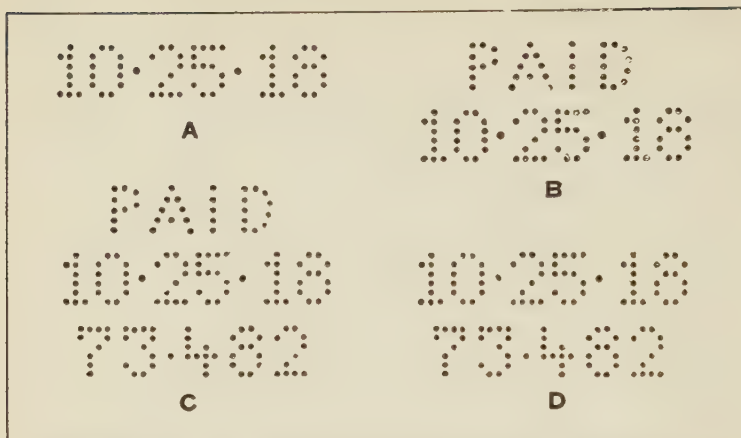


Figure 61: Several forms of cancelation are shown here. The first line illustrates the regular six-figure date; the next is used when payment should be indicated; the third shows date, payment, and the bank's A.B.A. number; the fourth is a combination of date and A.B.A. number. See page 207.

speed of from 180 to 225 cancelations a minute. For high-speed quantity production, motor-driven cancelers are available.

Other uses to which canceling machines are put include the dating of deposit slips, notes, mortgages, and similar papers that should carry dates of their receipt, dates and evidence of payment, and often the identifying mark of the bank. A day, a month, or a year later the exact dates and other facts can be quickly and certainly known.

SIGNATURE DEVICES¹

In large concerns where there are thousands, or even only hundreds, of employees on the pay-roll, a very great amount of time must be given to getting out the pay checks. An instrument for signing 5 or 10 checks at one time speeds up this work.

This device consists of a table-bed with folding extension

¹Manufactured by The Signature Company. The large models are not sold, but leased.

leaf; a light endless chain across both runs at front and back, actuated by sprockets and a crank handle. To operate the device the checks are placed upon the extension leaf. When the handle is rotated, the chains, by means of evenly spaced lugs, carry two sheets of checks under the extension table.

Attached to the writing frame are 10 fountain pens spaced to cover the signature ground of the checks beneath. The writing frame, supported at each end by roller bearings jointly with the pens it carries, is under control of a monitor penholder or handle. When handled as a pen, the holder causes all the pens to respond simultaneously to its slightest movement. The writer signs 10 checks at once, then rotates the crank handle, thus throwing the signed checks around, under, and into a receiving tray, and at the same time drawing a new set of unsigned checks under the pens.

The instrument is easily adjusted for any size of check sheet not exceeding $18\frac{3}{4}$ by $9\frac{1}{4}$ inches, which measurement is in excess of any requirement for sheets of five checks. The usual width of individual checks is $3\frac{1}{4}$ inches. Unless instructed otherwise, all instruments are adjusted for the $3\frac{1}{4}$ -inch checks. Adjustments of the crank handle provide for left-hand as well as right-hand signature.

A smaller model of this same device is adapted for signing, simultaneously, sheets of five checks, and is adjustable to any size of checks not exceeding $3\frac{3}{4}$ inches in width. This model is based upon the same principle. The chief difference is that the entire instrument is enclosed in a mahogany case. When the case is open for use, the instrument swings out from the case, the open side forming a writing bed upon which the sheets of checks to be signed are inserted.

THESE APPLIANCES ALL SAVE MONEY

The greatest value of the appliance is the speed with which a great number of checks can be signed. The average

number of signatures ranges from 2,000 to 5,000 an hour. The output of a few writers has been from 30,000 to 31,000 in a day. Of course, results vary with the length of name and rapidity of the writer. On the smaller model, 2,000 signatures an hour is a fair average.

All the devices described in this section have been inspired by the need for speed, economy, and accuracy in the work for which they were designed. The progressive business man recognizes the dollar- and time-saving qualities of new machines and is quick to install those which will improve his office practice.

XII

COIN-CHANGING DEVICES

The problem of making change is an important one. How the problem was solved. Features of the modern coin-changer: the coin tray; the keyboard; the coin chute; the split-change key. Types of coin-changers now on the market: the payer type; the changer type; a variation. How and where the coin-changers are used to great advantage.

THAT coin-changing is a subject worthy of serious thought will be realized when one considers the vast number of businesses that handle cash payments, or that have to make cash change. Practically every business which deals directly with the public—for instance, banks, amusement parks, theaters, public utilities, railroads, cafeterias, restaurants, and, in general, all retail stores—faces the problem which cash change presents. So does also every industrial or manufacturing concern in pay-roll work, except where wages or salaries are paid by check.

In connection with this problem there are two important elements which must be recognized—system and service. Everywhere system and service go hand in hand, and the entire significance of office appliances is summed up in those two elements. Especially is this true of office appliances used by businesses which deal directly with the public. To solve the problem of coin-changing, therefore, the question is: How can the business which deals directly with the public serve that public by making the correct change in the most efficient manner? To amplify, how can the correct amount of change be delivered in the quickest and most convenient way both to the payer and the receiver?

The question is not new. In fact, it was more than 40 years ago that the first device looking toward the solution of this

problem was invented.¹ A later invention of a coin-changing device, the first and only one to pay any combination by one-key depression, came about as the result of the realization of such a need by a young teller² in a Wisconsin bank.

This young man was struck by the fact that the change portion of cashing a check took a much longer time than the currency portion. At times when this young teller was called upon to handle cash payments, and especially in payroll work, he realized more fully than ever that a mechanical device designed to deliver coins would be of great service. As a result of his thought, study, and work, came the unique mechanical "cashier."

With this early coin-changer any given amount of broken change from one cent to ninety-nine cents could be had by the depression of a single key. Such a method eliminated the slow and often inaccurate process of figuring mentally, selecting and counting by hand a certain amount of change.

FEATURES OF THE MODERN COIN-CHANGER

With such a broad field as that represented by the businesses making cash change, it was natural that the introduction of the mechanical coin-changer should find a waiting market. Although the idea of an automatic coin-changer was first worked out by an individual, it was taken up by several companies³ and developed along independent lines, until now there are several different types of coin-changers on the market. However, before a classification of the

¹Mr. William H. Staats was the inventor of this first coin-changing device. It consisted of a rack in which coins were held and from which they were released, one at a time, by the depression of a lever controlling the channel. The patent was issued on this device, known as the Staats Money Changer, on February 25, 1890.

²Edward J. Brandt was the inventor of this one-key depression type of coin-changing device known as the Brandt Automatic Cashier.

³Coin-changers are manufactured by such companies as Brandt Automatic Cashier Company; Electric Change Machine Company; George F. Clute Manufacturing Company; Hoefer Change Maker Company; Hedman Manufacturing Company.

various types can be given, a description of the features of coin-changers will be taken up. The coin tray, the keyboard, the coin chute, and the split-change key are some of the important features which are common to all types.

The Coin Tray. Separate channels for each denomination of coins—pennies, nickels, dimes, quarters, and half-dollars—make up the coin tray. Silver-dollar channels may be added to some models, making it possible for the device to pay from one cent to five dollars. The position of the tray is in direct view of the operator, so that he can tell when it should be refilled. As the tray is removable it may be placed in the vault at night without necessitating the removal of the coins from the device.

The Keyboard. A means of choosing and delivering the coins is provided by the keyboard. Although the number of keys varies as the models and types differ, the position of the units follows the general principle of numerical order—that is, the units, tens, twenties, and so on, up to the nineties, are in numerical succession, which greatly facilitates the learning of the keyboard and the order of key units.

The Coin Chute. The channel through which the coins fall is called the coin chute. For various needs there are certain kinds of coin chutes, making possible three different methods of delivery: hand, direct, and pay-roll.

The hand delivery method consists of a receptacle which collects the coins. When the receptacle is guarded by a trap door it is opened by means of pressing back this trap door with the fingers, thus allowing the coins to fall into the hand. The direct delivery method consists of an additional trough leading from the device to a cup which is readily accessible to the customer, so that he may easily remove the coins. The pay-roll delivery method consists of an open chute under which the pay envelope may be held to be filled.

The Split-Change Key. To pay certain denominations in

fractional coins the split-change key is used. The one dollar split-change key would pay a half, quarter, two dimes, and a nickel.

TYPES OF COIN-CHANGERS NOW ON THE MARKET

Although the manufacture of coin-changers followed along the same general line—each device having common features—the process of operation differed. As a result there are now, according to operation, two distinct types of coin-changing devices, which may be called, for this purpose, the *payer* and the *changer*. Briefly, the payer is that type which delivers the amount indicated by the key depressed; the changer computes and delivers the difference between the amount indicated and one dollar.

*The Payer Type.*¹ While all coin-changing machines of the payer type have common features such as have been described, different models vary. This fact is borne out by the group of illustrations in Figure 62 which are all of the payer type. A glance at the illustrations will reveal the striking resemblance they bear to each other: each has a keyboard, a coin tray, a coin chute, and a split-change key. A careful study, however, will show that the assemblage of the features is different in practically every case. For instance, the position of the keyboard in illustrations B and C is reversed in illustration A.

The payer coin-changing device as illustrated by A of Figure 62 is constructed with the coin tray directly below the keyboard.² Note also from the illustration the storage tray above the keyboard. This model is equipped with an automatic coin lock, which locks and releases automatically without the necessity for manual control. Before any coin channel can become depleted and cause an error in

¹The payer type of coin-changing device is manufactured by such companies as Brandt Automatic Cashier Company; George F. Clute Manufacturing Company; Electric Change Machine Company; Hoefer Change Maker Company; and Hedman Manufacturing Company.

²Manufactured by such companies as Brandt Automatic Cashier Company.

payment, the lock operates to lock the entire mechanism and thus warns the operator to reload the low channel. Filling the channel unlocks the machine.

The release lever is placed in the lower right hand of the keyboard. After the lock is released it remains so until a special lever is operated to bring the lock back into action. The operation of this device is very simple, for any designated sum up to a dollar may be paid out by simply depressing the key corresponding to that amount. The coins delivered are always in the fewest number possible for the amount paid.

In regard to physical appearance, the payer coin-changer which is shown in illustration B of Figure 62 differs in two respects:¹ First, the position of the keyboard is reversed from that of illustration A; second, the chute is on the outside of the device. From the illustration, note that this particular model is equipped with a direct delivery coin chute. Further differences are in the release lever, which is on the *upper left-hand* side of the device, and the split-change keys which are provided for each denomination of coins. The automatic lock is released by holding up the release lever and it automatically goes back into action as soon as the release lever is allowed to drop into normal position.

The coin tray of the payer coin-changing device, as pictured in illustration C of Figure 62, is in the same position as that of illustration B; however, the coin chute is encased so that only the receptacle is visible.² Although the position of the keyboard is the same as in illustration B, the arrangement of the keys differs. The four banks of keys are arranged for the four-quarter division of a dollar; the white keys in the center control the pennies; and the red keys, 25, 50, and \$1, are for split-change of these amounts.

The payer coin-changing device shown in illustration D of Figure 62³ differs in appearance more distinctly than

¹Manufactured by such companies as Hoefer Change Maker Company.

²Manufactured by such companies as Hedman Manufacturing Company.

³Manufactured by such companies as Electric Change Machine Company.

any of the others shown. The coin tray and coin chute form one separate unit while the keyboard forms another. Notice from the illustration how the keyboard unit is connected with the delivery unit by the electric cord only. This separation allows the placing of the delivery cup outward towards the customer and at the same time the placing of the keyboard in a convenient position for the operator. Although the device operates by electricity, it otherwise follows the general principle previously given.

There are two kinds of keyboards on this type of device:

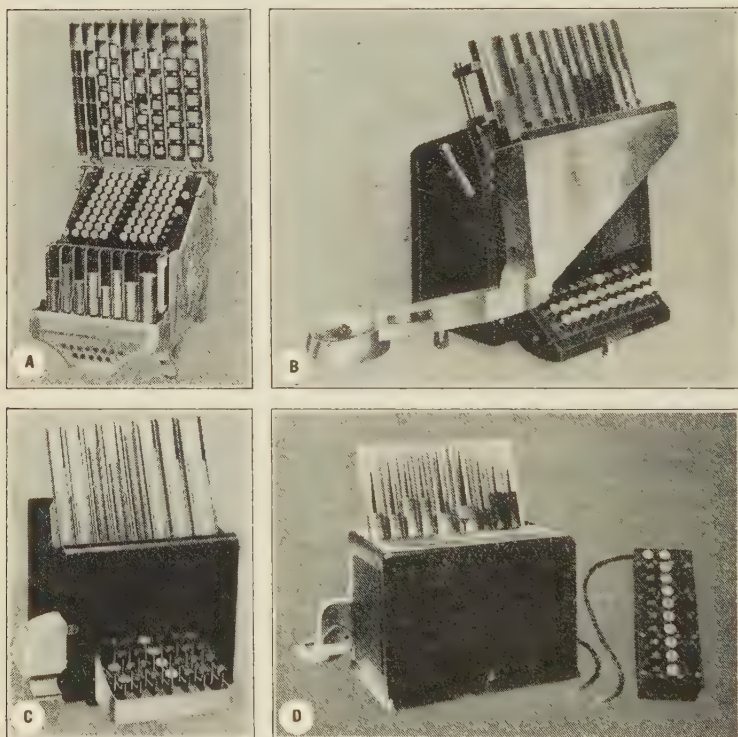


Figure 62: By pressing a key, or keys, of these coin-changing devices, any desired amount of money can be had. The coins may be delivered into the operator's hand (illustrations A and C) or into the delivery cup direct to the customer (illustrations B and D). Other interesting features are described on pages 214 and 215.

first, machines which have a full set of keys for all amounts from one cent to one dollar; and second, machines which have keys for the multiples of five and penny keys from one to five. In using the former to get, say, 82 cents, the 82 key would be pressed, while in the latter, to get the same amount, the 80 and the 2 keys would be pressed—either simultaneously or separately.

It is interesting to note just how the payer coin-changing device is operated. When a stream of customers rush into a bank with checks to be cashed, each transaction can be accomplished in a few seconds if a payer coin-changer is used. If a check for 10 dollars and 94 cents is presented, the cashier depresses key 94 and instantly a half-dollar, a quarter, a dime, a nickel, and four pennies fall into the receiving receptacle. With this change a 10-dollar bill is passed to the customer, which completes the transaction. However, if the customer specifies that he wishes the half-dollar in change, the operator depresses split-change key 50 and automatically a quarter, two dimes, and a nickel are ready for delivery. If 10 cents is to be in pennies, the split-change key is depressed twice, thus paying 10 pennies. Other combinations can be worked out mathematically to suit individual requirements.

When serving pay-roll customers, the cashier can supply coins in less than the wrapped amounts with the aid of an auxiliary tray attached to the top of the machine. If \$3.38 is to be paid out in pennies, the amount may be handled by paying \$3 worth of pennies wrapped, 25 cents in pennies from the auxiliary tray, and 13 pennies from the payer. Practically all kinds of coin-changing devices may be equipped with a reserve storage tray. These trays contain multiples of coins in amounts less than are usually had in rolls and are an advantage when the customer wants a number of coins of one denomination.

Likewise, the cashier of retail stores can speed up transactions with a payer type coin-changer. When a customer tenders \$2 for a \$1.18 purchase the cashier may use the well-

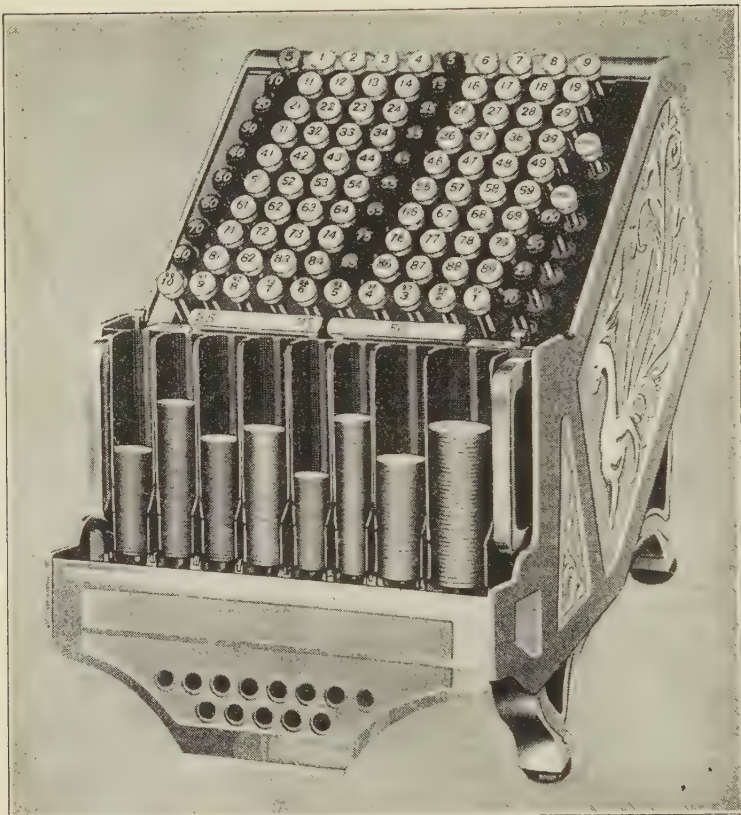


Figure 63: This coin-changing device eliminates the necessity of figuring mentally or on paper to find the amount of change due. Correct change may be extracted with such a device by simply pressing the key denoting the amount of purchase. See page 219.

known build-up method. He depresses key 2 to build up the 18 cents to 20 cents, then he depresses key 80, completing the building process to one dollar. The payer immediately delivers the correct amount, 82 cents.

*The Changer Type.*¹ As has been stated previously, the

¹The changer type is manufactured by such companies as the Brandt Automatic Cashier Company; Hoefer Change Maker Company; and Hedman Manufacturing Company.

changer type computes and delivers the difference between the amount of purchase and the sum of payment. Since the sum of payment varies to a great extent, there must be a mechanical means of providing for a shifting of the basis of the transaction. As the dollar is very often the basis of exchange, the changer device operates upon this basis, and provides also a means of changing the basis of transaction from one dollar to smaller amounts.

Automatically this device makes change and returns the amount without the necessity for mental computation on the part of the operator. The difference between the two types of coin-changing devices may be explained by example. When the 87-cent key of the payer is depressed, 87 cents is delivered. However, when the 87-cent key of the changer is depressed, 13 cents, the correct change out of one dollar, is delivered.

In appearance the changer type closely resembles the payer type, although the changer is of entirely different construction. Compare the similarity of the device shown in Figure 63, illustrating the changer type, with illustration A of Figure 62, illustrating the payer type. The bars just under the keyboard in Figure 63 provide a means of transferring the basis of change from one dollar to 25 cents, 50 cents, and 75 cents.

When the amount tendered is one dollar or over, the changer is operated by depressing one key which represents the amount of purchase; when the amount tendered is less than one dollar, the changer is operated by depressing the proper shift bar, corresponding with the sum tendered, then depressing the key corresponding to the amount of sale. It will be interesting to mark how a transaction in a retail store is carried out by means of a changer. If 25 cents is paid for a 17-cent purchase, the cashier depresses the shift bar 25 and then the key 17. Instantly the correct change, 8 cents, rolls into the delivery receptacle. Likewise, if 50 cents is paid, the operator depresses shift bar 50 and key 17, and so on.



Figure 64: Pay-roll work is greatly simplified when a device such as this is used. Various adaptations of the coin-changing device to other kinds of work are given on page 221.

A Variation. One type which differs very greatly from the two types of coin-changing devices described is one which uses levers¹ as the mechanical means of selecting and delivering the desired change. There are six levers, one each for pennies, nickels, dimes, quarters, halves, and dollars. By pressing the proper lever the desired coin drops into the palm of the operator's hand. Thus any combinations of coins can be had merely by operating the levers for the denominations of coins wanted.

¹Manufactured by such companies as George F. Clute Manufacturing Company.

This coin-changing device has only one feature which is in common with those described—and that feature is the coin tray.

Storage coin trays may also be provided as a part of the regular equipment.

HOW AND WHERE THE COIN-CHANGERS ARE USED TO GREAT ADVANTAGE

So wide is the scope of business in which there is a need for coin-changing devices that it warrants an enumeration of the kinds of businesses which use payers and changers to the greatest advantage. Banks, industrial and manufacturing concerns, public utilities, hotels, theaters, amusement parks, railroads, bus and boat lines, cafeterias, cafes, restaurants, and all retail stores where cash payments are made find the coin-changer almost indispensable.

Even in these unrelated businesses the coin-changer is used in practically the same manner. In banks, the payer type, direct or hand delivery, is generally used to the greatest extent; however, large banks have need for the pay-roll delivery model also. The paymaster of large industrial and manufacturing concerns finds the pay-roll delivery of the greatest value in filling pay-roll envelopes (see Figure 64).

In offices in which receipts are returned, such as public utility offices, or in offices where tickets are sold, such as amusement parks, railroads, bus and boat lines, the hand delivery model is often used so that the change may be placed upon the receipt or ticket when issued. However, some offices of this kind prefer the direct delivery models.

Theaters, cafeterias, cafes, restaurants, and all retail stores where cash sales are made most often use the direct delivery coin-changer.

In each of these businesses the mechanical coin-changer renders service to those who use it. It allows the cashier to serve the customers promptly and accurately. Not only does this modern device save the time of the cashier and

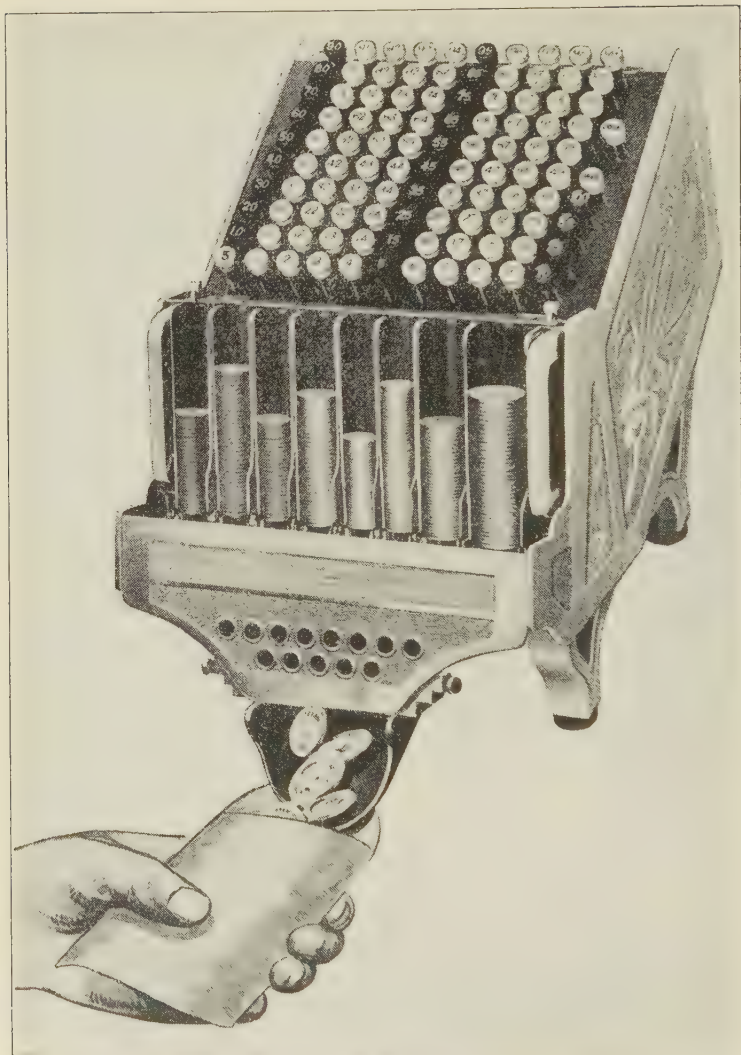


Figure 65: Concerns which pay employees in cash find the pay-roll coin-changer, such as pictured above, of great value. Note how the pay envelope can be filled direct when this style machine is used. Figure 64 also shows the pay-roll coin-changer. These two illustrations present only one of the numerous uses of the coin changer. See the section beginning on page 221.

customer, but it conserves the cashier's mental energy, it removes drudgery and brain fag, and it gives never-failing accuracy which promotes and strengthens the customer's confidence.

XIII

COIN-HANDLING DEVICES

Savings effected by mechanical coin-handlers. Early stages of the coin-handling machine. Machines classified as to function. Coin separators. Coin-counting and packaging machines: bag-loading machine; proving and bagging machines; continuous counting and bagging machines; counting-machine heads; manual counters and packagers. Coin-counters and separators. Use of coin-handling devices universal.

WHATEVER the business enterprise, if it involves the daily handling and packaging of large quantities of coins, the investment in a coin-handling device will prove to be very profitable. In banks, department stores, cafeterias, factories, newspaper offices, telephone and railway offices, bus lines, excursion boats, amusement companies, the use of mechanical devices for the sorting, counting, and packaging of coins has resulted in a considerable time- and labor-saving—a saving of at least 80%, according to the report of those organizations where the mechanical sorting and counting of coins has replaced the old hand-counting method.

Before the introduction of mechanical devices for coin handling, it was a slow, tedious process, involving several people, to count and package a day's receipts. Quite naturally, too, where human fingers operated, there was always present the danger of overcounting, or time lost in recounting, as a consequence of fatigue, both of mind and body.

With the mechanical device, fatigue, distractions, and errors are eliminated. The employer who has his counting done mechanically need take no cognizance of these factors, which enter into the daily routine where human fingers perform the task. He simply pays the initial expenditure of the machine and can rest assured that the coins will be correctly sorted, counted, and packaged in the minimum of

time and with the least possible effort on the part of the operator.

Nor are all the advantages on the part of the employer, when these mechanical devices are introduced. The employee finds his work minimized and his chances for accuracy increased to 100%. Imagine the old "hand counter," who, at the end of a busy day, must begin the sorting and counting, or counting and packaging of large quantities of coins of various denominations. Again, picture this same worker beginning this task with the assistance of a reliable coin-handling device.

EARLY STAGES OF THE COIN-HANDLING MACHINE

Judging by the practicability of these machines it is natural to surmise that the first machine ever invented was accorded a warm welcome. This, however, is not true; the first invention of a device for counting coins is credited to a man named Bonsano, who, in 1856, was issued a patent for such a machine, and there is no record that Bonsano ever succeeded in interesting users in this machine. No further development in coin-handling devices occurred until 1880, when a machine was designed by Morrison.

The model designed by Morrison flattened out the coins and carried them to a raceway by centrifugal force. This same principle first used by Morrison is employed in the construction of coin-handling machines today.

The next development came when J. M. Johnson, an employee of the United States Sub-Treasury of Chicago, secured a patent for a machine that embodies the principles of the one patented by Bonsano, with added improvements. With this invention the manufacture and distribution of coin-handling machines began in earnest. The first coin-counting machine of Johnson's invention was leased to the First National Bank of Chicago in 1902. It consisted of a complete machine, or head, for each denomination of coin,

and counted in bulk only. Later, these counting devices, equipped with automatic locks for packaging predetermined quantities of coins, were designed and distributed throughout the country.

A portable machine of high speed and strength to withstand the heaviest duty had not yet been produced by any of the manufacturers of coin-counting devices. Then development began on a machine to cover these features and resulted in a device that offers every convenience in counting, packaging, and bagging coins. This improved design constituted the fourth important development and patent on coin machines. High speed and accuracy are assured by the superior construction of the modern machines and they offer an interesting contrast to the hampered operation of the early models.



Figure 66: The tedious and laborious task of sorting a large number of mixed coins is transformed into a simple and untiring operation when a coin-separating machine is used. The operation of this type of coin-handling machine is explained on page 231.

MACHINES CLASSIFIED AS TO FUNCTION

The basic need for coin-handling devices—namely, to relieve the human fingers of the mechanical sorting, wrapping, and counting of large quantities of coins—determines in a measure their classification. Coin-handling devices have

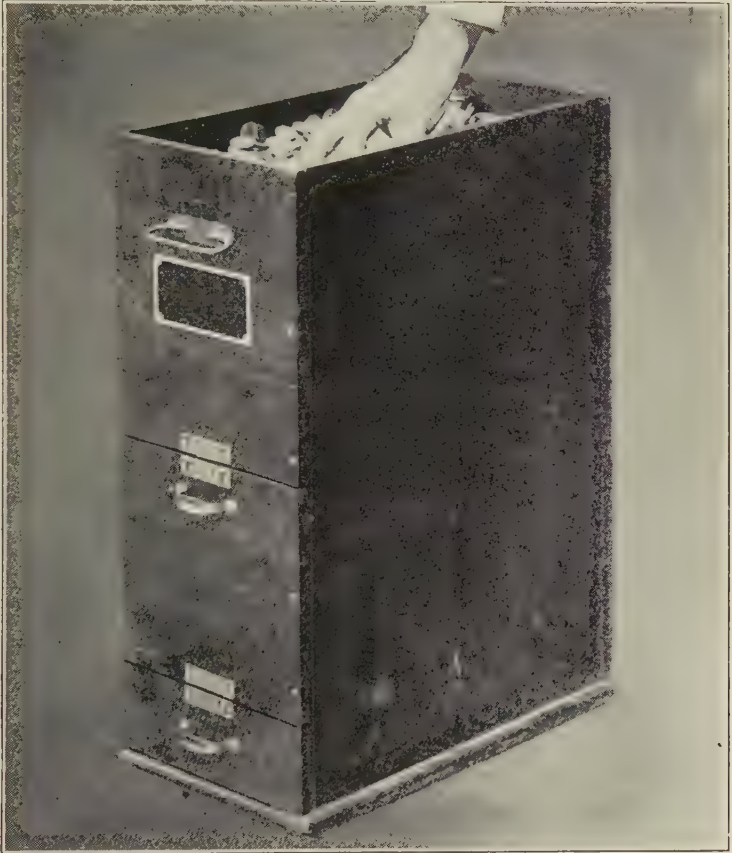


Figure 67: This coin separator sorts pennies, nickels, dimes, quarters, and half-dollars. The coins are placed in the top of the device, and by the action of gravity they slide down perforated inclined steel sheets and fall into their respective drawers. See pages 231 and 232 for full details.

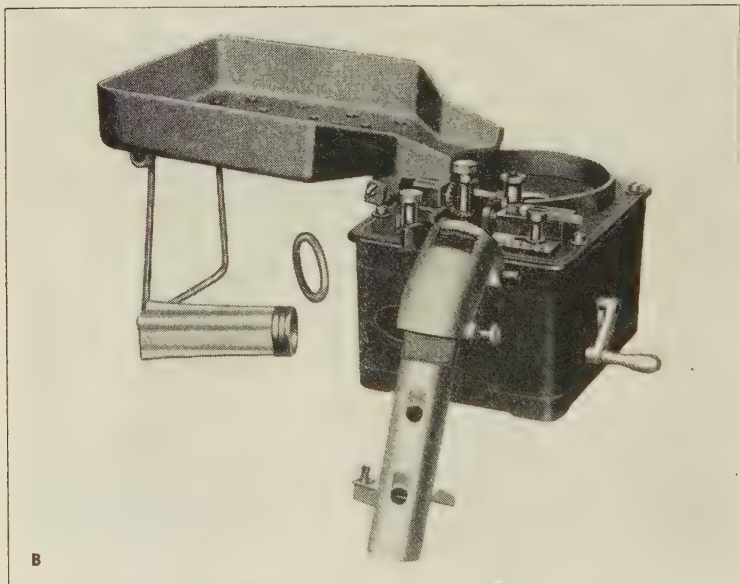
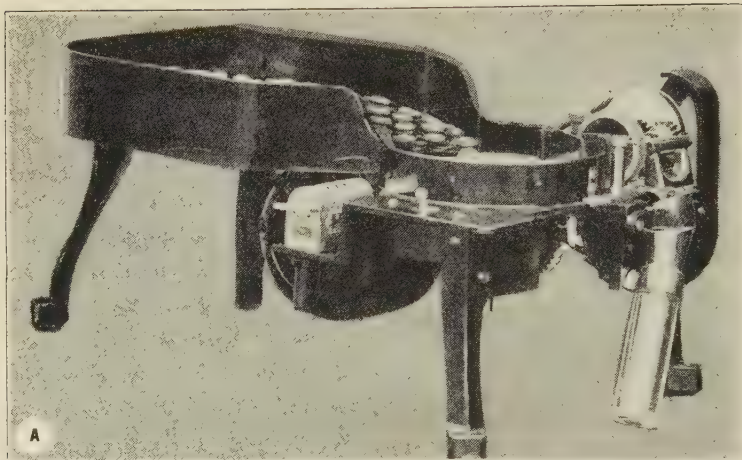


Figure 68: Machines of the type pictured above count and wrap into uniform packages any one denomination of coin. The operation is quite simple, as the machines do all the work. The wrapper is merely held at the lower end of the stem and the bundle is turned. See page 232.

been designed for a definite purpose, and the variations from the general type are specifically intended to take care of needs arising in specific business enterprises. It is only in a few instances that coin-handling devices of a certain type can be adapted to use of another kind. A concrete example of this is the counting and sorting machine,



Figure 69: There are various types and models of coin separators and coin-counting and packaging machines. The illustration above shows a separator which handles five denominations at one time. For complete descriptive details, see page 232.

which may be utilized for either purpose independently.

Briefly, then, the important divisions of coin-handling devices, according to the functions they serve, are: (1) coin separators, which, as the name indicates, simply sort into denominations mixed coins, ranging in value from pennies to half-dollars; (2) coin-counting and packaging machines, designed to count coins of all denominations by a simple adjust-



Figure 70: The machine illustrated above shows the counting and packaging unit of the separator in Figure 69. Both this machine and the coin-separator unit are operated electrically.

ment from one denomination to another, and equipped for packaging coins; (3) coin-counters and separators, which perform the dual rôle of counting machine and sorter, and separate and count mixed coins in a single operation.

COIN SEPARATORS¹

These sorters are the most elementary of all coin-handling devices and have been in use for many years. Originally these devices followed the sieve principle, sorting coins but not being capable of highly selective sorting, which was perfected later. There are, at the present time, several sorting machines on the market, all very similar in appearance but deviating the position of the tray, the hopper, or the boxes where the coins are deposited after they have been sorted into their individual denominations. These sorters are all portable, hand- or motor-operated, and can separate coins at the speed of 1,000 to 1,200 per minute.

Figure 66 illustrates how one of the many styles of coin separators is operated. Coins of mixed denominations are poured into the tray. As the machine is operated, the coins are fed into the hopper. The disk mounted in the hopper revolves, picking up the coins by means of grooves and carrying them to a slanting device having slots of different sizes. As the coins roll down this device they drop through the slots. Below there is a container divided into compartments to hold each denomination of coins. If desired, these machines can be built to sort metal tokens. It is to street railways, cafeterias, banks, and similar concerns, where the daily intake of coins of mixed denominations requires careful sorting, that these mechanical devices are of greatest service.

A coin separator or sorter² which is constructed on an

¹Manufactured by such companies as The C. L. Downey Company; Jorgensen Manufacturing Company; The Sattley Company; and Standard-Johnson Company, Incorporated.

²Manufactured by such companies as Abbott Coin Counter Company.

entirely different principle is one which is operated entirely by gravity (see Figure 67). This device is a cabinet about 2 feet long and 8 inches wide. The coins are poured into the top of the cabinet and drop through holes. They rapidly separate as they slide down perforated inclined steel sheets, and fall into the respective drawers for dimes, pennies, nickels, and quarters. Half-dollars and silver dollars are too large to pass through the feed holes. The top of the cabinet can hold about 4,000 coins. It is claimed that this type of machine will separate 3,000 mixed coins in less than two minutes.

COIN-COUNTING AND PACKAGING MACHINES¹

This type assumes major importance in the category of coin-handling devices, inasmuch as it is the only one of the three kinds of machines that renders the unique service of counting coins and delivering them indirectly into bags or wrappers, and, in specific cases, checking predetermined amounts into bags. That these devices are in general use in Federal Reserve banks and United States mints is a silent testimonial for their accuracy and adaptability. The coin-counting and packaging machines on the market to-day represent the highly perfected result of a series of experiments and tests covering a period of several years. Figures 68 and 70 show two models of coin-counting and packaging machines. It is interesting to note the similarity of the working principle in each of the three machines illustrated in these two figures. Note that the machine shown in Figure 68, illustration B, is operated by hand power, while those shown in Figures 68 (illustration A) and 69 are operated by motor power.

A generalization of coin-counting and packaging ma-

¹Manufactured by such companies as Abbott Coin Counter Company; The C. L. Downey Company; Jorgensen Manufacturing Company; The Sattley Company; and Standard-Johnson Company, Incorporated.

chines reveals that there are two distinct kinds of this type—those which employ, and those which do not employ, the revolving disks. The machines which are disk-driven are equipped with tray, hopper, revolving disk, counter arm, tubes, continuous or set-back registers and automatic stops for packaging coins in desired quantities. These stops can be set for continuous count and are very easily adjusted for the different denominations of coins. The majority of counting machines are operated by centrifugal force through a slot against a star wheel and under feed rollers. They can be built for all sizes of metal tokens, and equipped

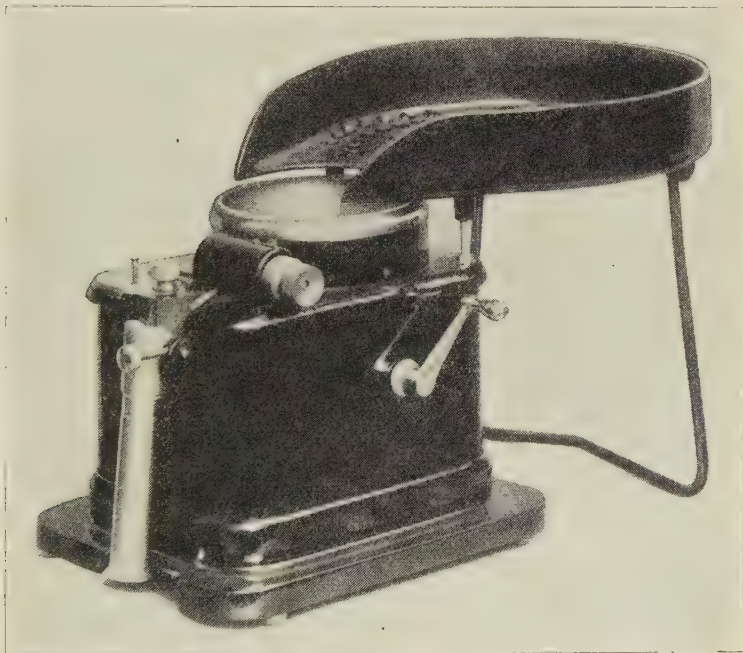


Figure 71: Another model of the hand-operated counting and wrapping machine is shown here. Obviously, machines of this type have a great distribution, due to their simplicity of operation. Owing to the great disproportion in the numbers of the different denominations of coin in normal commercial mixtures, the larger combination types are practical only in the larger institutions.

with automatic stops for any desired number of packages.

Coin-counting machines which are hand-driven and which handle pennies, nickels, dimes, quarters, and half-dollars are also built in models to handle silver dollars. For counting into bags—for counting and packaging coins in small banks, churches, and so on, or for counter work in large banks—a hand-driven machine is made which can be set for 10-20-30-40-50-100 or to count continuously into bags.

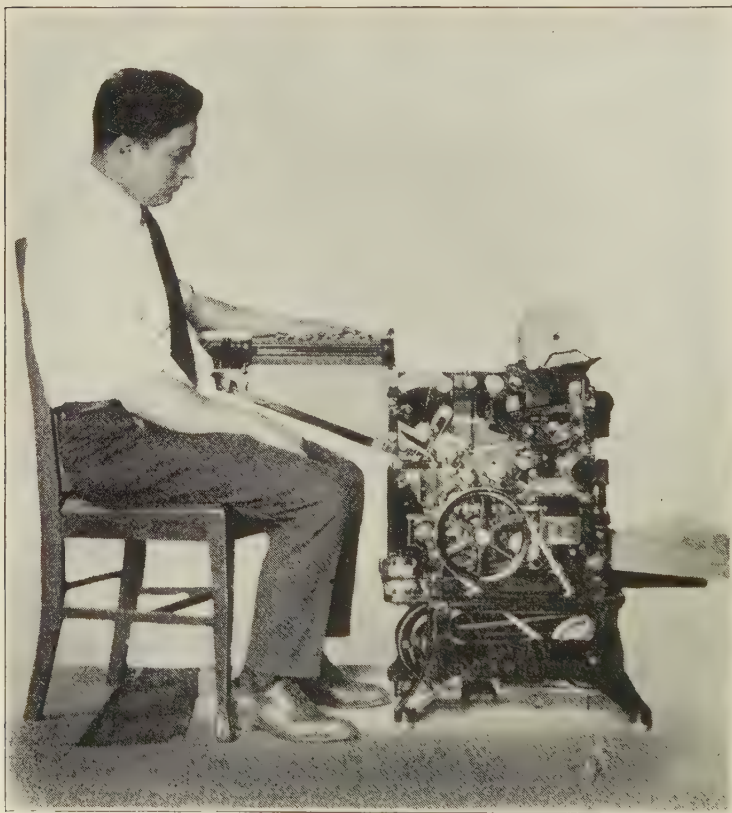


Figure 72: Coins are fed by hand, counted, wrapped, and crimped automatically within this machine. An interesting feature is the use of a continuous roll of paper for wrapping, instead of the ready-made tubes.

Note the roll on top of the machine. Also see pages 236 and 238.

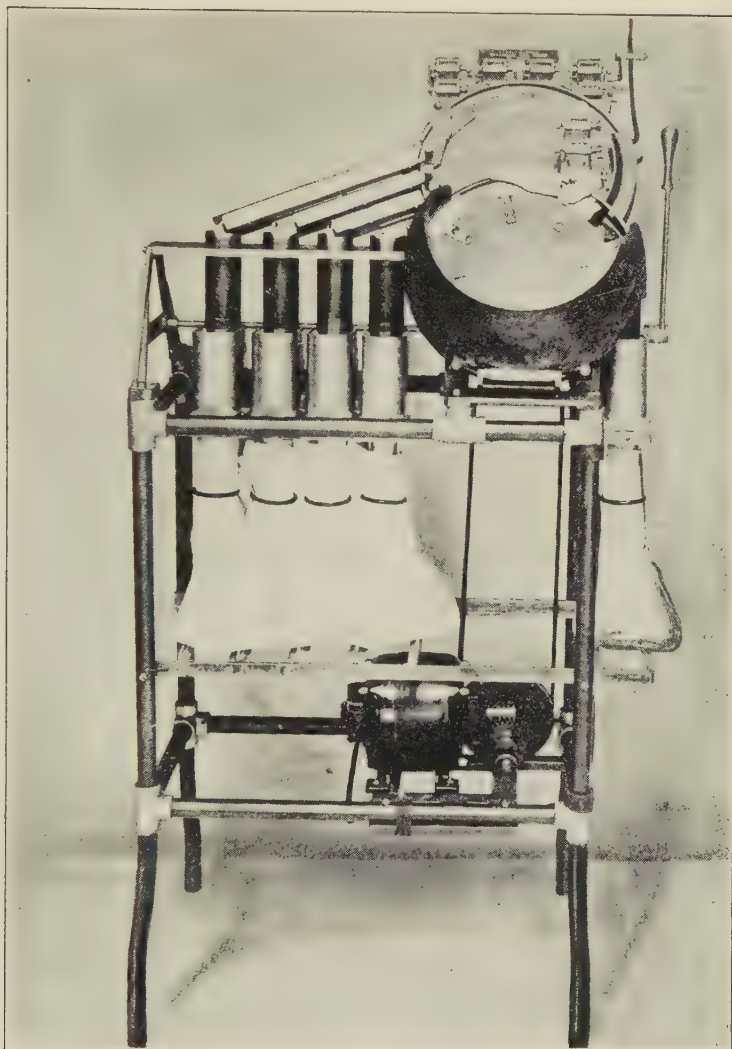


Figure 73: Five bags can be filled—each with a different denomination of coin—with this machine. The mixed coins are dumped into the hopper, the motor is started, and in only a few minutes' time all the coins are sorted, registered, and bagged. Note the separate counters for each denomination of coins. For a more detailed description, read page 239.

The method of operation of the coin-counting and packaging machine may be divided into two parts:

The first part is coin counting. A quantity of coins is poured into the machine, and the revolving disk in the nopper begins its work. The centrifugal force encountered throws the coins to the outer edge of the machine, where there is a height gage under which the coins slide. This gage is so regulated that it is possible for only one coin to slide under at a time, and thus, no two coins can lap one another. Each coin always registers only one.

The second, for the wrapping or packaging of the coins, requires that the operator place a tubular wrapper in the lower end of the stem, which is closed by holding the little finger over the end. The free hand is used to draw coins into the hopper. Seven to fifteen packages can be counted with this device in one minute.

After the coin has passed the star wheel, it travels forward in the raceway, drops through a stem in front of the machine, and falls into a tubular wrapper which the operator has previously placed inside the stem. When the desired number of coins to fill a package has been recorded, the machine automatically locks off further passage of coins. Time may be allowed to remove the filled wrapper and place another in position when the lock is released by the operator. The speed of the hand-driven machines depends on the skill of the operator. Those machines used for rapid counting and packaging usually are motor-driven.

The counting and packaging machine, which does not employ the revolving disk¹ for feeding coins to the counting and wrapping device, is equipped with a flat, horizontal tray, on which the coins are dumped and fed by hand over one edge, and a device which seals the packages as they are delivered. Every detail of counting and wrapping is completed in the machine. The finished package is auto-

¹Machines of this kind are manufactured by such companies as Automatic Coin Wrapping Machine Company and The Sattley Company.

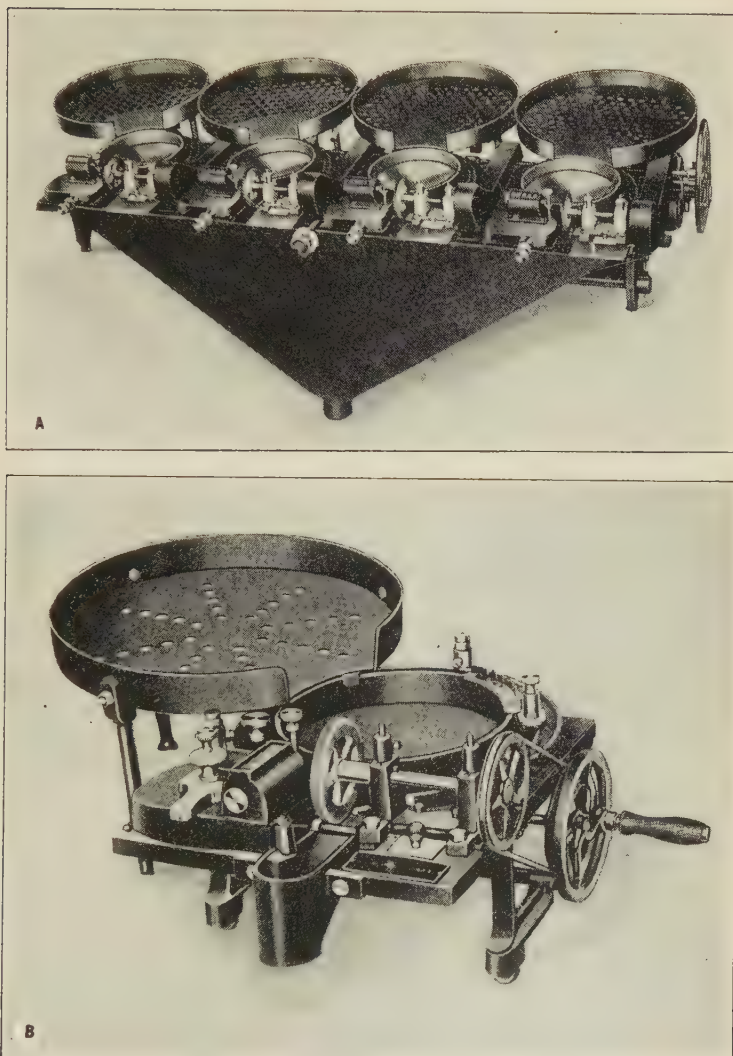


Figure 74: Proving and bagging and continuous counting and bagging can be accomplished with these two machines. Illustration A represents the device which recounts coins previously sorted. Illustration B shows a coin-handling device which continuously counts and bags coins. Figure 75 shows a motor-driven continuous counting and bagging machine.

matically ejected into a catch box, sealed at both ends with a strong crimp. (See Figure 72.)

Five self-locking adjustments set the machine for counting, wrapping, and sealing coins in the standard-sized packages. The clearances are so accurate that even slightly bent or mutilated coins are detected. One adjustment insures correct thickness of each individual coin; others, the diameter, number per package, and length of the assembled roll.

An interesting feature of this machine is the use of a continuous roll of paper for wrapping, instead of ready-made tubes. As the coins are counted and packed, the ribbon of paper is fed down. When the required number are in place they are carried over onto the paper and tightly wrapped. A crimping arm next comes into play which rolls the edges of paper down and makes a tight crimp seal

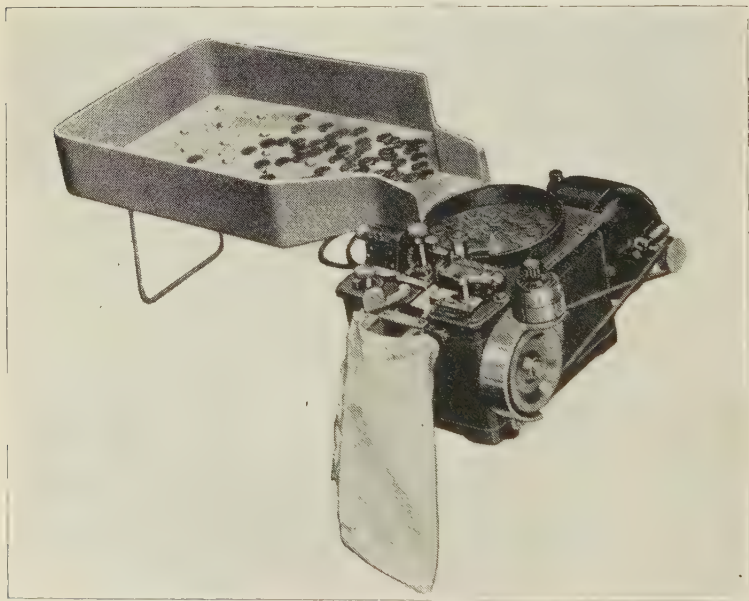


Figure 75: Here is shown another electrically operated coin-handling device which both counts and bags coins of various denominations. For complete details, see page 240.

on both ends of the package. This method of sealing makes it impossible to extract a single coin from the package without destroying it. It also prevents undetected tampering and eliminates the bother and expense of adjusting claims for shortages.

The identity and value of each package are assured by the use of different-colored wrappings for each denomination. Plain printing, on each wrapper, gives the name of the institution issuing the package, the number of coins, denomination, and total value of the package. As the face of the coins shows at each end of the package, every possible safeguard is provided to make identification instant and easy. It thus reduces the likelihood of error to the lowest minimum.

In a study of coin-counting and packaging machines it is interesting to note the variations from the general type described in the preceding paragraphs. While many of these special machines incorporate the common characteristics of the average coin-counters, they also are designed to serve a very specific purpose. The following is a brief outline of these machines and some of their various uses:

*Bag-Loading Machine.*¹ As its name implies, this appliance was devised especially for loading bags. Figure 73 is just one example of several makes, showing how bags may be loaded by means of a counting and packaging machine. This motor-driven machine counts pennies, nickels, dimes, quarters and half-dollars. Because of its rapidity and ease of operation, this kind of machine is of great assistance to cashiers in department stores, and to paymasters, as it may also be used for filling envelopes.

To operate the machine the coins are placed in the hopper. Note from the illustration that each section or denomination of coin has a separate counter which may be set for con-

¹Machines of this type are manufactured by such companies as Abbott Coin Counter Company; The C. L. Downey Company; Jorgensen Manufacturing Company; The Sattley Company; and Standard-Johnson Company, Incorporated.

tinuous counting, or which may be reset. When the motor is started, the coins are sent rapidly through the counting device and into the proper bag. By setting the automatic lock at a given number, any specified number of coins can be counted and bagged in only a few minutes' time.

*Proving and Bagging Machines.*¹ The purpose of this type of counting machine is to count and bag separated coins, such as the coins turned in by street-car conductors or cash-register clerks. It is equipped with separate hoppers for each denomination, is motor-driven, and has a speed of 1,500 coins of each denomination per minute. Machines of this type are built in different sizes to handle few or many denominations. (See illustration A of Figure 74.)

*Continuous Counting and Bagging Machines.*² The motor-driven machine which continuously counts and bags coins at a very high rate of speed is especially valuable in concerns where a vast amount of coin is handled. The hopper is filled with one denomination of coin and the automatic lock is set at any desired amount. For instance, if the automatic lock is set for 1,000, the machine will automatically stop when 1,000 coins have been counted. (See Figure 75.)

*Counting-Machine Heads.*³ Machines which handle one denomination of coins at a time, including metal tokens, are of inestimable value to those companies which handle metal tokens or coins in large quantities. When equipped with an attachment for packaging coins, the counting-machine heads can be set to count and wrap in predetermined amounts.

¹Machines of this kind are manufactured by such companies as Standard-Johnson Company, Incorporated.

²Machines of this kind are manufactured by such companies as Abbott Coin Counter Company; The C. L. Downey Company; Jorgensen Manufacturing Company; The Sattley Company; and Standard-Johnson Company, Incorporated.

³Machines of this kind are manufactured by such companies as Abbott Coin Counter Company; Jorgensen Manufacturing Company; The Sattley Company; and Standard-Johnson Company, Incorporated.

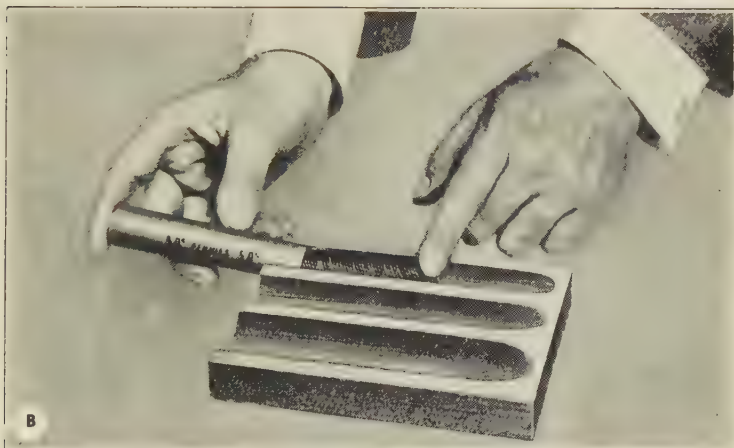


Figure 76: The hand process of counting and wrapping coins is simplified when a stacker or a tray is used. Illustration A shows how coins may be counted and slipped into a stacker. When the stacker is filled, the coins are poured direct into a paper wrapper. Illustration B indicates how coins may be slipped from the tray into a wrapper. See page 242.

*Manual Counters.*¹ Manual counters are made in four sizes: for pennies, nickels, dimes, and quarters. These devices combine hand counting and wrapping in one operation. A stacker which is used is a tube-like stem device, the top of which spreads into a funnel-shaped or tray-like opening. The coins are counted by sliding them into the stacker. They either drop directly into a tubular coin-wrapper which is held in the lower end of the stem, or they fall into the stem of the stacker and are poured into a tubular wrapper when the desired amount has been counted. (See illustration A of Figure 76.)

A packaging tray² has also been devised to facilitate manual wrapping. This tray consists of troughs into which the counted coins are slipped edgewise when these coins are to be wrapped. A tubular wrapper is held at the end of the trough and the coins are slipped directly into the wrapper. (See illustration B of Figure 76).

COIN-COUNTERS AND SEPARATORS

The third general kind of mechanical coin-handling devices serves the twofold purpose of counting and sorting coins of mixed denomination, all in one operation. These particular machines are a combination of the sorting machine and the counter and packaging machine and do not differ greatly in appearance from either of the other two. Figures 77, 78, and 79 are composed of illustrations of coin-counters and separators. Note how these machines resemble the coin-counting and packaging machines. The coin-counter and separator is used most extensively by financial institutions where the daily intake of thousands of coins of mixed denomination presents a real problem.

¹Machines of this kind are manufactured by such companies as Abbott Coin Counter Company and The C. L. Downey Company.

²Trays of this kind are manufactured by such companies as Abbott Coin Counter Company and The C. L. Downey Company.

Among the many types there are three important models of coin-counting and separating machines. The first model, represented by Figure 77, is known as the counting and sorting machine¹ and operates by means of a calipering² device which takes the diameter of the coin. The registering device also provides for a totalized sum in connection with each separate adding counter. After each load of mixed coin is counted, the single adding counters are reset; the total sum counters continue to accumulate the number of each denomination of coin sent through the machine. This machine is unique, inasmuch as it sorts and counts coins in a single operation and is either a sorting or a counting machine that can be used independently for either purpose.

The second model, illustrated by Figure 78, is for the purpose of separating and counting coins, and is constructed to handle five denominations of coin at one time.³ This same style of machine is also built in models which handle three and four denominations and metal tokens.

The coins are sorted in the usual manner. As each coin passes through the proper channels the counting device adds one. This motor-driven machine is also equipped with automatic locks. As the coins are issued into the receptacles they may be retained there until the operator desires to dispose of them. Then the operator may deposit each denomination of coin into bags, boxes, or trays, by operating a lever which releases all denominations at the same time.

The third model,⁴ represented by Figure 79, automatically sorts, registers, and counts in dollars and cents with a subtotal and summary total register, both of which may be reset to zero. It packages one or more denominations and sacks the balance in the same operation, or packages or sacks

¹Machines of this kind are manufactured by such companies as The C. L. Downey Company.

²A caliper is an instrument like a pair of compasses which is used for measuring diameters.

³Machines of this kind are manufactured by such companies as Standard-Johnson Company, Incorporated.

⁴Machines of this kind are manufactured by such companies as The Sattley Company.

all at a capacity of over 40,000 coins an hour. For street railways, department stores that package money, and banks having money to sort or that accept their depositors' coins in bulk, it is proving itself indispensable.

USE OF COIN-HANDLING DEVICES HAS BECOME UNIVERSAL

So universal has the use of coin-handling devices become that the manufacturers have endeavored to cover every phase of the field. The result is that it is now possible to meet the specific requirements of almost any business and to provide for that particular business the exact type of machine mechanically suited to its needs. Companies can now furnish machines that range from small, inexpensive

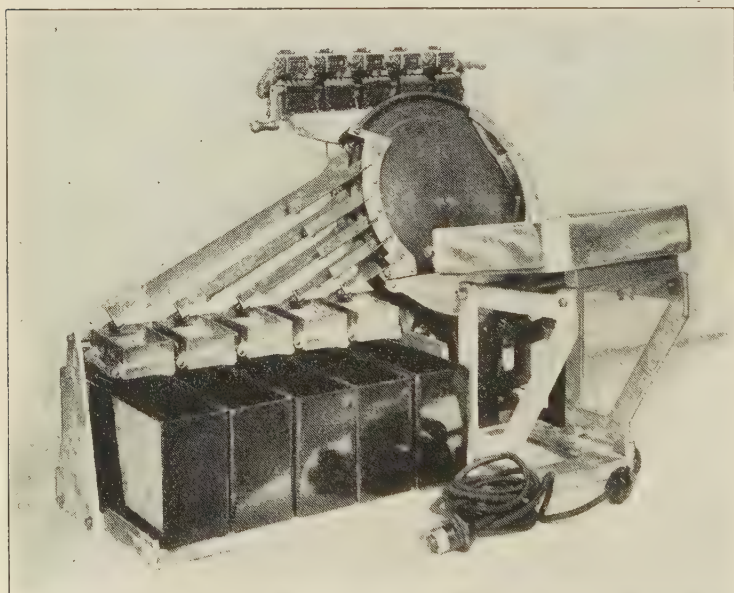


Figure 77: This is the counting and sorting machine which is operated by means of a calipering device as described on page 243. As the coin passes through the measuring device it is sorted and registered on the proper adding counter. A totalized sum may be also obtained. Note the two counters for each denomination.

hand-driven models to large, electrically equipped devices for the heavy work of such great institutions as the United States mints and Federal Reserve banks. Banks, churches, railway, gas, light, and telephone companies, department stores, and theaters are the chief business enterprises that have utilized these money-, time-, and labor-saving devices.

Not only, however, have these machines been employed for the purpose of sorting, counting, and packaging coins,

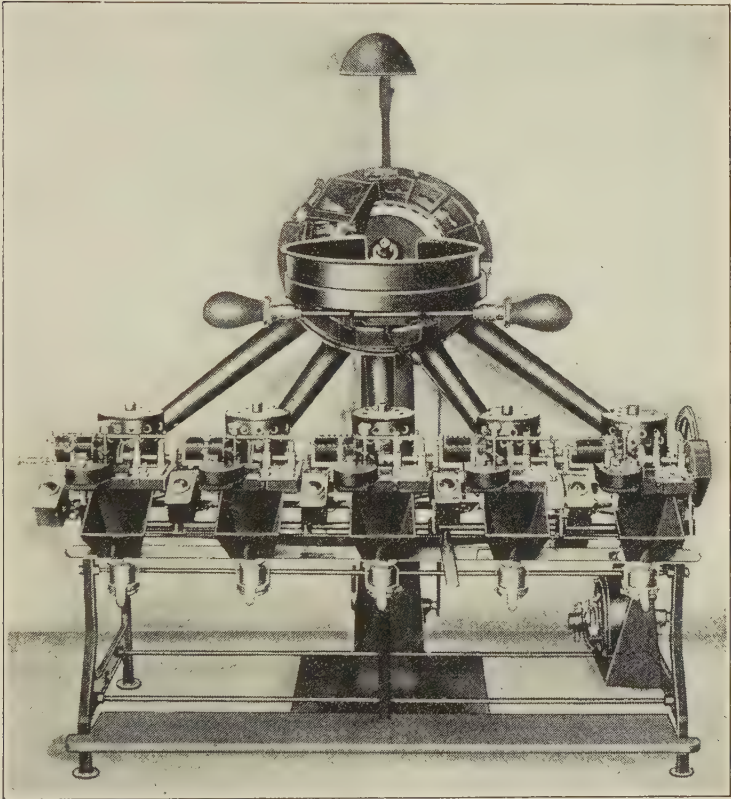


Figure 78: Here is another style of counting and sorting machine. Although it differs vastly in appearance from Figure 77, its purpose is the same. It sorts mixed coins, registers the amounts separately, and deposits them in bags or trays. Read page 243 for a description of this machine.

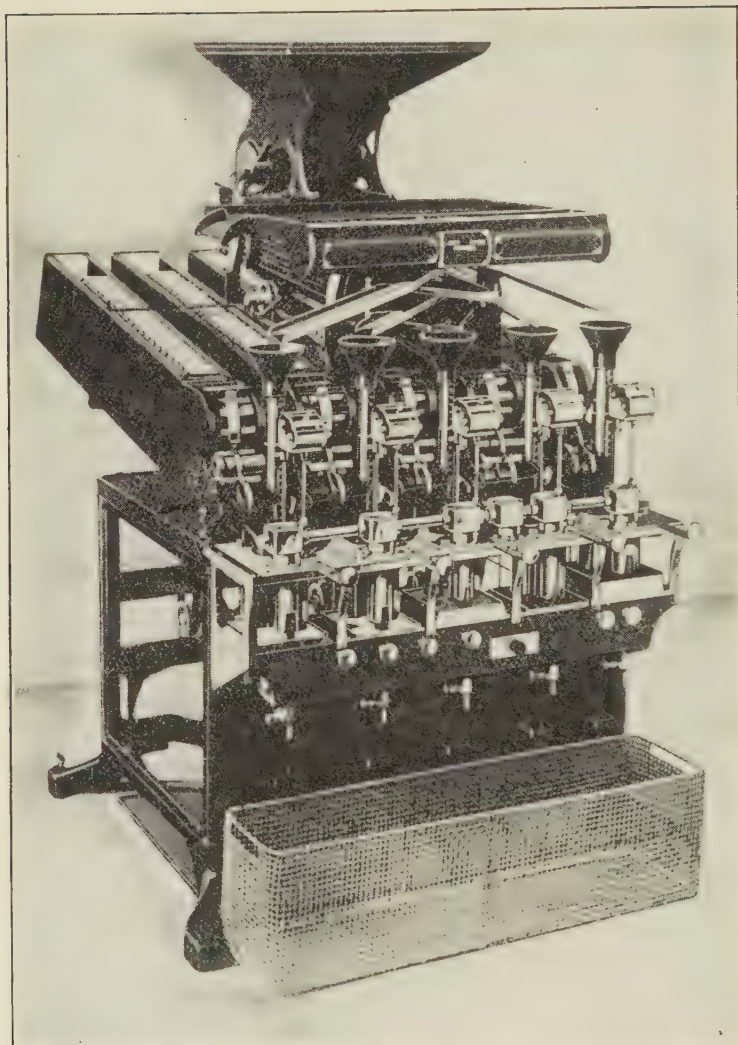


Figure 79: A third style of counting and sorting machine is shown here. (Compare with Figures 77 and 78.) This machine also affords a subtotal and summary total register which may be reset to zero. It packages one or more denominations and sacks the balance in the same operation. See pages 243 and 244 for further details of this machine.

but they have in many cases been used to check "turn-ins" of cashiers and conductors. The use of these machines has meant positive protection against losses arising from overcounting, undercounting, and recounting. It is because they perform all these tasks accurately and economically that coin-handling machines have been accorded an important place among other time- and labor-saving devices described in this book.

Perhaps the greatest service of coin-handling devices has been rendered to the Government of the United States. The substitution of mechanical coin-counters, sorters, and wrappers for human fingers has resulted in the conserving of hundreds of thousands of dollars annually. In addition, it has solved the problem of accuracy, which is of great moment in the working of both the Treasury Department and the Federal Reserve banks.

XIV

AUTOGRAPHIC REGISTERS

Every transaction requires a record. The first step in the development of record-keeping. How autographic registers developed. Means of attaining alignment. Types and kinds of autographic registers in use today. The roll form type: the manifold; the roll recorder; the total summary. The flat packet type: the manifold; the flat packet recorder. Autographic register systems.

EVERY transaction, regardless of its nature, requires a record; and that record, if it is to answer its purpose, must be not only accurate, but readily available for a check and audit—in other words, there must be established a chain of evidence which proves the absolute correctness of that record. Further, every person interested in a transaction should be protected by an exact copy of the record of that transaction. It can readily be seen, therefore, that a method of record-keeping which provides several copies at one writing becomes a most valuable time- and money-saver, especially in retail stores and other places of business where the record of transactions plays an important part.

The first mark of progress in the development of record-keeping was the introduction of the use of reproducing paper. This reproducing paper—or carbon-paper, as it is now called—in a sense revolutionized store record-keeping. At first, loose slips interleaved with carbon-paper came into use, and they served their purpose satisfactorily until a greater need brought forth the sales-slip pad, which has had a very wide range of use in office systems. And it was from this method that a mechanical means of recording transactions developed—namely, the autographic register.

Among other needs, the autographic register supplies a ready method of audit and control and a positive and safe

way of handling written entries—a way that is complete, quick, and readily accessible. It insures accurate and complete vouchers, speeds up production, and lessens the possibilities of losing or misplacing records of sales and other important business data. (See Figure 8o.)

HOW AUTOGRAPHIC REGISTERS DEVELOPED

For a number of years the autographic register has been in general use in business; in fact, it is probably one of the oldest types of office equipment. While the sales-slip pad, interleaved with carbon-paper, provided the necessary fundamentals for the introduction of the autographic register, the actual invention was prompted by a lawsuit in 1880. The essence of the case lay in the fact that the office record of a transaction had been altered by an employee and there was no way of determining under what circumstances this alteration had been made. The lawyer who tried the case, James C. Shoup,¹ of St. Louis, was impressed with the necessity of some mechanism which would issue to the customer a receipt, furnish a duplicate for office use, and at the same time provide a third copy so protected that it could be accessible for checking only by some specially authorized and responsible person. His reasoning was that every business transaction should be represented not only by a written record, but by an indisputable duplicate or, if necessary, a triplicate, copy of that record, handled so as to be safe from loss, tampering, or falsification.

His thoughts on the problem evolved, first, the principle of the locked-up record; second, the idea of continuous forms; and finally, that of a duplicating device which would guarantee facsimile copies. After the suit was settled, Mr. Shoup worked at odd times on the development of such a device and finally brought out a working model which, although crude in design, contained the essential protective

¹James C. Shoup was founder and first president of the Autographic Register Company, which he organized in 1883.

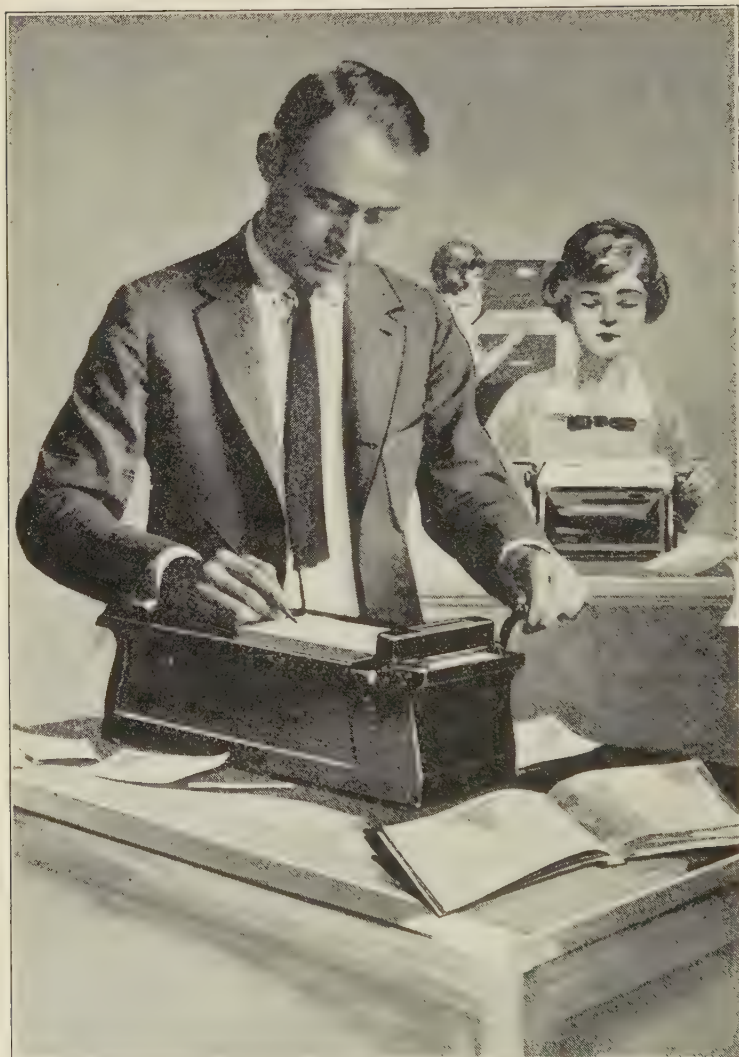


Figure 80: The autographic register offers an accurate, quick, and simple means of keeping records in an office. Furthermore, it supplies a ready method of audit and control and a positive way of handling written entries. As the forms are issued, the copies may be sent—through the regular office routine—to typist and the file clerk. See page 249.

features of the modern autographic register. This device made three facsimile copies covering every transaction, the third copy being rewound in a locked-up recess, accessible only to the proprietor of the establishment or his auditor. Mr. Shoup's autographic register was later refined into the device illustrated in Figure 81; it was first made of wood and, later, of metal. This register was destined to develop into a product which in its different forms is used in practically every kind of business enterprise.

The original device provided only for duplicate or triplicate blank paper rolls. When the transaction had been entered fully, by turning a crank the triplicate copy was rewound in a locked compartment, while the original and duplicate copies were issued and torn off. Accurate alignment—that is, registration between the original and successive copies—was impossible. The first improvement was the very obvious one of printing rules and columns, the name of the concern, and other appropriate headings on the original copy. Because of lack of alignment, however, neither the duplicate nor the triplicate copies could be printed, even if a tear-off point was marked on the original as was the custom.

Within a few years various minor improvements were made, but the next distinctive step consisted of the development of the pull-out type of register, on which two or more forms could be kept in better alignment. The forms were grasped tightly between the thumb and forefinger, pulled out to a stop mark, and torn off. The advantages of having more than one copy printed greatly increased the possibilities of the autographic register as an efficient business tool, but even at that time the autographic register still had its limitations.

The gradual acceptance of the manifold-machine idea and the increasing knowledge on the part of the public of the advantages of continuous forms led all autographic register

manufacturers to work on the perfecting of some device which would accurately align all copies and issue them automatically. As a result, several methods of attaining the alignment were developed.

MEANS OF ATTAINING ALIGNMENT

The four methods of attaining alignment which developed are the pin-studded guide wheel; the finger mechanism; the steel disk; and the drive wheel and roller shaft.

The pin-studded guide-wheel type employs a special kind of wheel construction, the studs of which enter a series of holes in the margin of the forms, thus holding them in alignment with each other as the forms are discharged from the machine by a turn of the crank handle.

The finger-mechanism type employs a device which automatically measures the forms as they are issued. As the

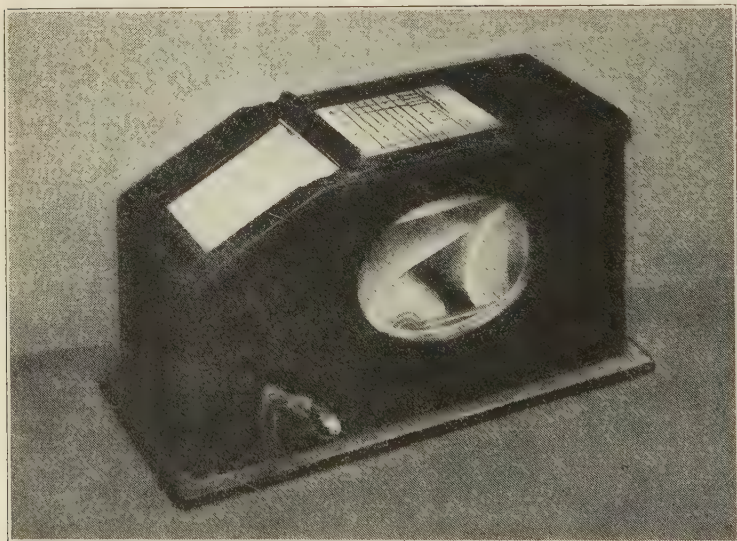


Figure 81: The early autographic register had many of the features of the modern device. Notice that the aperture at the side shows how the roll forms were placed in the register and fed through the top. See page 251.

forms are drawn out, two small rods fit into perforations in the end of the form, thus stopping and aligning the paper as it comes into position.

The steel-disk type grips the forms tightly between disks and collar rollers. As the forms move forward, the holes engage with the collar and disk roller and then stop automatically, as there is no further action on the paper.

The drive-wheel and roller-shaft type holds the forms between a drive wheel and roller shaft so that the operation of the crank draws the sheets forward to a point slightly beyond the tearing point where they are automatically released and drawn back over stationary hooks or teeth which

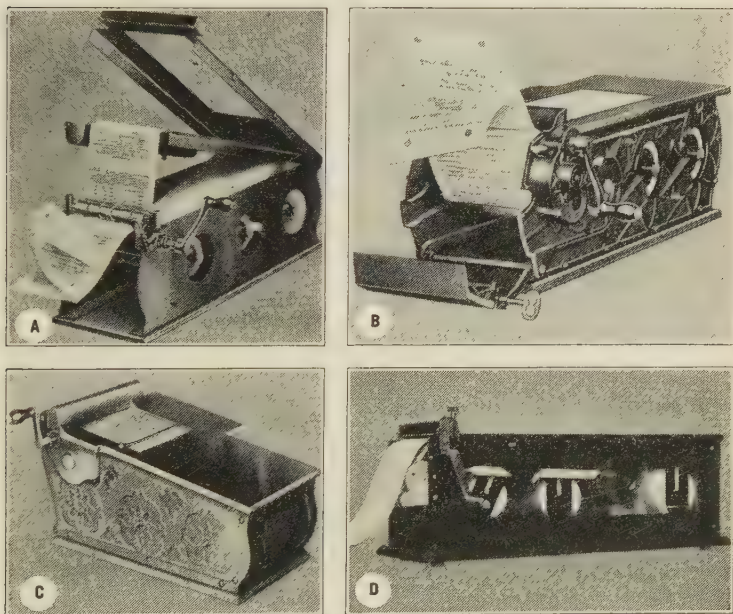


Figure 82: Roll form registers make up this figure. Illustration A, the manifold folder which issues all forms, presents clearly the method of threading the forms. Illustration B reveals the method of retaining a record. Illustration C represents a total summary register, while illustration D shows a form-printing register. Note the printing device located between the paper rolls. See pages 254 and 257.

engage with the punched holes and consequently align the forms.

TYPES AND KINDS OF AUTOGRAPHIC REGISTERS¹ IN USE TODAY

There are two general types of autographic registers on the market today: first, the roll form registers; second, the flat packet registers. The roll form registers use printed or blank continuous strips of paper rolled or spooled upon tubes or cores. The flat packet registers use the continuous strips of printed sales slips accordion-folded in a zigzag manner so that the entire pack lies flat inside the register.

In the first general division—the roll form registers—there are three subdivisions: first, the manifolder; second, the roll recorder; and third, the total summary registers. In the second general division—the flat packet registers—there are two minor classifications: first, the manifolder; and second, the flat packet recorder registers.

THE ROLL FORM TYPE

Enclosed within the register are the continuous rolled printed forms. The size of the register depends upon the number of rolls used; however, registers are built to accommodate from two to six rolls. Each roll of forms may be of colored paper to distinguish the different copies—as, office, customer, and invoice copy. These forms are fed across the writing table or platen and then through the feed mechanism which moves the paper after each form is written. Between each of the sheets as they lie on the writing surface are threaded transverse sheets of carbon-paper which are also

¹Autographic registers are manufactured by such companies as American Sales Book Company, Limited; Autographic Register Company; The Egly Register Company; The Globe Register Company; The Hamilton Autographic Register Company; The Multiprint System Company, Incorporated; Pacific Manifolding Book Company; Printing Register Company; The Standard Register Company; and United Autographic Register Company.

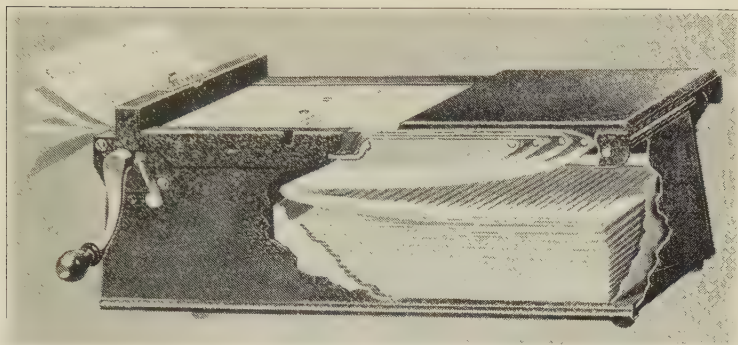


Figure 83: Manifold registers issue all copies. The method of holding the flat packet forms within the manifold register is shown. See page 258 for full details.

fed from a roll placed so that the worn portion of the carbon-paper may be cut or torn off without disturbing the printed sheets. Although the slips are taken out of the machine, the carbon-paper remains stationary until its use is no longer effective. Fresh carbon-paper is brought into position by means of a release device or by raising the lid of the register and pulling a new supply across the writing table of the register. The group of illustrations in Figure 82 shows each of the different kinds of roll form autographic registers. Note how the forms are inserted in the register and also how the carbon-paper is interleaved with the roll forms.

A roll form register which differs from the type here described is one which uses blank paper and which prints the desired forms as they are issued from the register. The forms are printed in two ways: one, from metal electrotypes as they are propelled from the register by means of the crank handle, and the other, from a rubber-type form which is interchangeable. In all other respects the self-printing register conforms to the general type.

The Manifold. The register which issues all copies is called the manifold register. When an entry is made, a set of tickets is issued from the register and the act of re-

moving the completed tickets places the next set ready for the following entry automatically interleaved with carbon-paper. All makes provide for renewing with fresh carbon-paper when necessary, as has been described. Most entries are pencil-written in a form that is designed and specially printed to save writing. Illustration A of Figure 82 represents the manifold register of the roll type.

There are three methods of issuing the forms: the hand pull-out method, the lever release, and the crank method. The hand pull-out method of issuing the forms is accomplished by simply grasping the edge of the written copy and pulling it out to the end of the individual form. Then by pulling the form up against the sharp knife-like edge of the register the copy is quickly detached. A second method, the lever release, is based upon the pull-out method. By operating a lever the first set of forms is aligned and released so that they may be pulled out by hand. A third method, the crank method of discharging forms, winds out the copies to the end of the individual form where the several copies are torn off against a knife edge.

The Roll Recorder. The register which retains one copy and issues one, two, or three copies is called the roll recorder register. It is divided in two sections or compartments—one compartment for the unwritten supply of roll forms, the second compartment for the written record copy which is rewound upon a spool or core. The unwritten forms are fed across the platen or writing table where they are interleaved with carbon-paper. The bottom form is fed forward into the front compartment where it rewinds upon a spool.

Illustration B in Figure 82 shows the roll recorder type of register which discharges the forms by means of the crank method. Note how the copies are retained within the register. Forms from this type of machine are issued in somewhat similar manner as from the manifold register, that is, by the pin-studded guide wheel, the steel disk, and the drive wheel and roller shaft principle. Roll recorder machines are

all operated by the crank method, this being necessary on account of the feeding and rewinding operations being geared together.

The Total Summary. The autographic register, which issues two or more copies of a transaction, retaining a summarized or tabulated record within the cabinet, is called the total summary register. Although the discharged copies carry a full and detailed record of the original transaction, the summary record which is retained within the locked receptacle of the register as a private copy, carries only that portion of the original entry which appears in the summary space at the bottom of the original printed ticket. This summary is arranged in columnar form, under classified headings, so that the user will have in tabulated form the result of each day's business for easy and ready reference. This is made possible owing to the fact that the summary ticket travels only a fraction of an inch, while the discharged tickets are issued at a much greater length. The merchant, therefore, has a convenient and dependable means of balancing cash and checking up the individual sales of each employee. Illustration C of Figure 82 shows the roll form of summary register which discharges the forms by means of the crank method.



Figure 84: The manifold register shown here is also a flat packet type register; however, it issues the forms by means of the lever device.

Illustration D of Figure 82 shows a model of the self-printing type of autographic register. Note how the printing mechanism is placed in the register.

THE FLAT PACKET TYPE

The forms which are folded in a zigzag manner so that they form a solid pack are encased in a register which is similar in outer appearance to the roll form register. Any number of forms may be used, each being interleaved with transverse carbon-paper. Each individual slip is numbered consecutively, and each set of forms may be of a different-colored paper to distinguish the different copies. Forms of this type have no tendency to curl. Figures 83, 84, and 85 are made up of a group of flat packet registers.

The Manifold. All copies of forms may be issued at once when a manifold type of flat packet register is used. The forms are encased within the register and fed across the writing table and through the feed mechanism, so that when operated all copies are issued at once (see Figure 83).

Autographic registers of this sort discharge the forms in two ways, by means of a crank and by means of a lever release. Figure 83 shows the crank method of discharge, while Figure 84 represents the lever release method.

The Flat Packet Recorder. When one full copy of a set

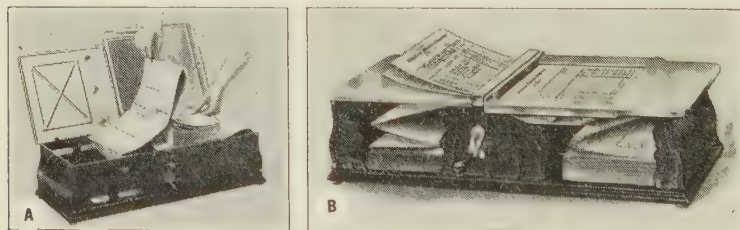


Figure 85: The recorder register retains a copy in a locked compartment of the register. This secret record may be referred to at any time, as is shown in illustration A. The manner of retaining the copy is revealed by illustration B. See below.

of forms is retained within the register and all other copies issued, the register is termed a flat packet recorder. At present there are two types of recorders using the flat packet forms, one in which the record copy is automatically cut off and filed in proper numerical sequence in the retainer compartment, and the other in which the record copy refolds in the retainer compartment. A key lock prevents any unauthorized person from having access to the records. The consecutive numbers on each slip facilitate the location of any particular record. The manner in which record copies are handled simplifies the process of auditing, as each individual slip may be turned just as the leaves of a book (see illustration A of Figure 85).

As the forms are drawn from the register they are easily and readily detached by means of perforations or by tearing against the sharp edge of the register lid. Illustration B of Figure 85 and Figure 86 show how the recorder register retains a record.

AUTOGRAPHIC REGISTER SYSTEMS

To say that an autographic register can be used in almost any business where handwritten records are required is no

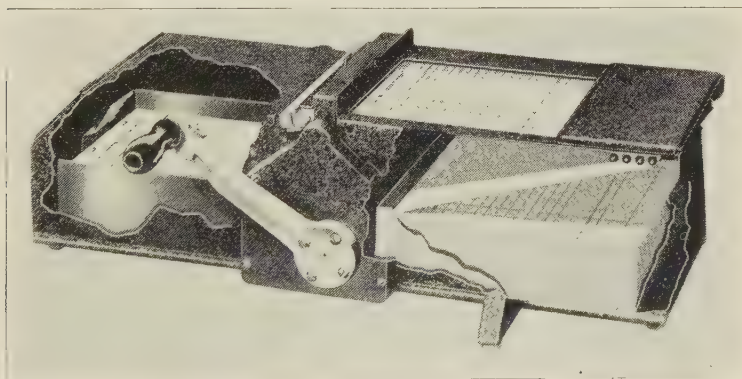


Figure 86: The forms are issued from this register by means of the lever. After making the original entry, it is only necessary to pull back the lever. Automatically copies for distribution are cut off, ejected, the record copy is filed and a new set of forms is brought into position.

exaggeration. Hundreds of different forms and combinations of forms have been designed for use with the machine. Each business must have forms to meet its particular requirements and ways of doing business. Therefore, autographic register systems are not ready-made, but rather "tailor made" to fit the specific and particular needs of each

MEMORANDUM

MEMORANDUM

SHIPPING ORDER

ORIGINAL

UNIFORM STRAIGHT BILL OF LADING—ORIGINAL—NOT NEGOTIABLE

RECEIVED, subject to the conditions and tariffs in effect on the date of this bill of lading.

At Havre, Montana, 192__

FROM **RYAN-HAVRE CO.**

COMPANY Agent's No. Shipper's No.

Consigned to _____ State of _____ County of _____

Destination _____

Route _____ Car No. _____

(Describing Contents)

BOXES BAKING POWDER	BOXES DRIED FRUIT	CASES PEANUT BUTTER	CRATES STARCH
BAGS BEANS	BAGS FISH	BAGS PEANUTS	BOXES SLICED
BOXES BLADING	BOXES FISH	BAGS PICKLES	BOXES STOVE POLISH
DOZ. BROOMS	PAIRS FISH	BAGS PICKLES	BOXES SUGAR
BOXES CANNED	BOXES SPICY FISH	CASES PICKLES	BOXES SUGAR
BOXES CANNED MEATS	CASES GLASS J. JARS	CASES PRESERVED	BOXES SUGAR
BOXES CANNED	BOXES CROCKERY	BAGS RICE (Good Reg)	BOXES SYRUP CANNED
PAIRS CANNED	CASES MONKEY	CASES SAL. DRESSING	JARRETS SYRUP
CASES CANNED FRUIT	BOXES PINE	BAGS SALT	BOXES TABLE SALT
CASES CANNED VEGET.	CASES JOLLY	BAGS SALT	BAGS TAPIOCA
CASES CATSUP	BOXES KELLY POWDER	BAGS SALT	CASES TEA
BAGS CEREALS	BOXES LAMP CORNMEATS	CASES SALT	BOXES TOBACCO SMO
CASES CEREALS	BOXES LAMP SUBSTITUTES	CASES SHUFF	BUTTS TOBACCO STD PD
CASES CEREALS, FLAKED	BOXES LIFE	BOXES SHOE BLACKING	BAGS TINKER
BAGS CEREALS	BOXES MILK, STAP	BOXES SOAP	CASES TINKER
BOXES CHOCOLATE	BOXES MINCE MEAT	BOXES SOAP POWDER	DOZ. WASH BOARDS
BAGS COFFEE	BAGS MUSTARD, PREP.	BOXES SOAP	BOXES WASH SOAP
BOXES COGNAC	BAGS MUSTARD, SHED	BOXES SPICES	BOXES YEAST CAKE
PAIRS COGNAC	CASES BUTTER OIL		
BAGS COFFEE	BOXES PAPER		
CASES COFFEE	BOXES PAPER, WAPL		
BOXES CRACKERS	SACKS PAPER BAGS		
CASES CRACKERS	BOXES PAPER BAGS		
CASES CRACKERS, CRATED	BOXES ITALIAN PASTE		

RYAN-HAVRE CO., Shipper, Per
Permanent Post-Office Address of Shipper: HAVRE MONTANA

April No. 10341

Figure 87: Autographic register forms afford efficient systems of record-keeping. The bill of lading form illustrated offers a complete method of billing. Note the four copies which are all handled in one writing: the original, the shipping order, and the two memorandum copies. Also note that the information is compiled so that the proper record of shipment is reduced to a minimum of time and effort. See pages 264 and 267.

Some of the main advantages for adopting autographic registers will be given here in summary form.

1. Autographic registers guarantee exact and complete records of every transaction.
2. They save time—speed up all operations, thus saving time in preparing forms for execution, by issuing written records quickly and accurately.
3. They prevent errors in the rewriting of records, as the original and all copies are made in the one writing.
4. They definitely fix the responsibility of each employee—a protection against carelessness and temptation, such as protection against loss of records, failure to record transactions properly, dishonesty in the recording of cash sales, deliveries, and so forth.
5. They eliminate complaint or misunderstanding between the customer and merchant, as with their use there is no possible chance of disagreement as to the terms of the original transaction, receipt for goods or amount of money paid.

No. 15016 Original to Purchasing Dept. Duplicate to be sent with material Triplicate Filed in the Stock Room	STOCK AND TRAFFIC STOCK ROOM OF SIXTON MANUFACTURING COMPANY, FAIRFIELD, ILLINOIS REQUISITION ON STOCK ROOM	MONTH DAY YEAR			
To be delivered to _____ To be charged to Account or Work Order No. _____					
REQUISITION MUST BE MADE OUT BY STOCK CLERK WHEN MATERIAL IS ISSUED.					
QUANTITY	DESCRIPTION	PRICE	PER	TOTAL	BALANCE ON HAND
1					
ORDERED BY _____		FILLED BY _____ STOCK CLERK		DISTRIBUTION ACCOUNT No. _____	

FORM 64 G O

Figure 88: The method of making out stock-room requisitions is demonstrated by the autographic form illustrated. When the stock-room requisition is made up in triplicate the original goes to the purchasing department, the duplicate is sent with the material, and the triplicate is filed in the stock-room.

6. They protect business by providing a positive check on auditing, billing, checking material in stock and inventory. They also provide a check on record of materials received and materials going out, cash received and cash paid out.

7. They furnish a means and create a foundation for all accounting procedure.

8. They supply a positive control over business through accurate, detailed, unchangeable and original entries of transactions, making possible quick audits and analyses of any case, thereby greatly aiding in detecting and eliminating errors and dishonest procedure.

9. They materially aid in securing all the profits derived from any business transaction.

10. They directly benefit the employer, the employees, and all others concerned in, or affected by, the transaction. They benefit the employer because they give a correct record of, or reference to, a transaction made at the time the transaction took place. They protect the employee because they furnish a copy of the transaction and prove one of two things—that the employee recorded

TRADE MARK 0563 REPORT OF RECEIPT OF STOCK ON ORDER NO. ROUGH SUPPLY FOUNDRY GENERAL

TRADE MARK 0563 REPORT OF RECEIPT OF STOCK ON ORDER NO. ROUGH SUPPLY FOUNDRY GENERAL

TRADE MARK 0563 REPORT OF RECEIPT OF STOCK ON ORDER NO. ROUGH SUPPLY FOUNDRY GENERAL

TRADE MARK 0563 REPORT OF RECEIPT OF STOCK ON ORDER NO. ROUGH SUPPLY FOUNDRY GENERAL

ALL OVER THE WORLD AND THRO' IT

FROM _____ INCOMING CHGS. _____

VIA _____

FOR _____ ORDER NO. _____ RECEIVING CLERK _____ DATE RECEIVED _____

Figure 89: The report of receipt of stock can be kept in as efficient a manner as the orders when the autographic register method is used. When 2 or 3 copies of forms are made out, different-colored paper may be used to distinguish the copies. Note how the illustration indicates the variation in colors. See page 267.

the transaction properly or made an error. In the case of error they place responsibility where it belongs and do not cast reflection or doubt on others. They protect the customer because they issue a written memorandum of what the customer purchased—quantity and quality, and the price at which the purchase was made—which reverts back to the benefit of the concern or employer and protects the merchant's business by preventing the possibility of misunderstandings with the customer. Then they protect the customer by giving him an itemized receipt of the transaction. This protection does not exist where only one copy of entry or record is made of a transaction between seller and buyer.

From the foregoing descriptions it will be readily observed that autographic registers are practically unlimited in their scope and sphere of use. Regardless of size or character of business, autographic register systems supply pro-

ACKNOWLEDGMENT OF ORDER



OUR ORDER NO. 05307

Ship to _____

Account of _____

Via _____

Date _____ 192__

Your Order No. _____

TERMS OF PAYMENT
30 Days Net
F.O.B. SOUTH BEND, IND.

Date Wanted _____

Promised _____

Shipped _____

QUANTITY	INCHES THICK	INCHES WIDE	INCHES DEEP WITH MET OPENINGS	STYLE LETTER ILLUSTRATED ON BACK	STOCK	THICKNESS	INK	PRICE PER M
(1)								
(2)								
(3)								
(4)								
(5)								

REMARKS

SHIPPING TAGS AND FACTORY TAGS OF ALL KINDS

We make shipping tags in the following sizes: 1/2", 3/4", 1", 1 1/4", 1 1/2", 2", 2 1/2", 3", 3 1/2", 4", 4 1/2", 5", 5 1/2", 6", 6 1/2", 7", 7 1/2", 8", 8 1/2", 9", 9 1/2", 10", 10 1/2", 11", 11 1/2", 12", 12 1/2", 13", 13 1/2", 14", 14 1/2", 15", 15 1/2", 16", 16 1/2", 17", 17 1/2", 18", 18 1/2", 19", 19 1/2", 20", 20 1/2", 21", 21 1/2", 22", 22 1/2", 23", 23 1/2", 24", 24 1/2", 25", 25 1/2", 26", 26 1/2", 27", 27 1/2", 28", 28 1/2", 29", 29 1/2", 30", 30 1/2", 31", 31 1/2", 32", 32 1/2", 33", 33 1/2", 34", 34 1/2", 35", 35 1/2", 36", 36 1/2", 37", 37 1/2", 38", 38 1/2", 39", 39 1/2", 40", 40 1/2", 41", 41 1/2", 42", 42 1/2", 43", 43 1/2", 44", 44 1/2", 45", 45 1/2", 46", 46 1/2", 47", 47 1/2", 48", 48 1/2", 49", 49 1/2", 50", 50 1/2", 51", 51 1/2", 52", 52 1/2", 53", 53 1/2", 54", 54 1/2", 55", 55 1/2", 56", 56 1/2", 57", 57 1/2", 58", 58 1/2", 59", 59 1/2", 60", 60 1/2", 61", 61 1/2", 62", 62 1/2", 63", 63 1/2", 64", 64 1/2", 65", 65 1/2", 66", 66 1/2", 67", 67 1/2", 68", 68 1/2", 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1/2", 697", 697 1/2", 698", 698 1/2", 699", 699 1/2", 700", 700 1/2", 701", 701 1/2", 702", 702 1/2", 703", 703 1/2", 704", 704 1/2", 705", 705 1/2", 706", 706 1/2", 707", 707 1/2", 708", 708 1/2", 709", 709 1/2", 710", 710 1/2", 711", 711 1/2", 712", 712 1/2", 713", 713 1/2", 714", 714 1/2", 715", 715 1/2", 716", 716 1/2", 717", 717 1/2", 718", 718 1/2", 719", 719 1/2", 720", 720 1/2", 721", 721 1/2", 722", 722 1/2", 723", 723 1/2", 724", 724 1/2", 725", 725 1/2", 726", 726 1/2", 727", 727 1/2", 728", 728 1/2", 729", 729 1/2", 730", 730 1/2", 731", 731 1/2", 732", 732 1/2", 733", 733 1/2", 734", 734 1/2", 735", 735 1/2", 736", 736 1/2", 737", 737 1/2", 738", 738 1/2", 739", 739 1/2", 740", 740 1/2", 741", 741 1/2", 742", 742 1/2", 743", 743 1/2", 744", 744 1/2", 745", 745 1/2", 746", 746 1/2", 747", 747 1/2", 748", 748 1/2", 749", 749 1/2", 750", 750 1/2", 751", 751 1/2", 752", 752 1/2", 753", 753 1/2", 754", 754 1/2", 755", 755 1/2", 756", 756 1/2", 757", 757 1/2", 758", 758 1/2", 759", 759 1/2", 760", 760 1/2", 761", 761 1/2", 762", 762 1/2", 763", 763 1/2", 764", 764 1/2", 765", 765 1/2", 766", 766 1/2", 767", 767 1/2", 768", 768 1/2", 769", 769 1/2", 770", 770 1/2", 771", 771 1/2", 772", 772 1/2", 773", 773 1/2", 774", 774 1/2", 775", 775 1/2", 776", 776 1/2", 777", 777 1/2", 778", 778 1/2", 779", 779 1/2", 780", 780 1/2", 781", 781 1/2", 782", 782 1/2", 783", 783 1/2", 784", 784 1/2", 785", 785 1/2", 786", 786 1/2", 787", 787 1/2", 788", 788 1/2", 789", 789 1/2", 790", 790 1/2", 791", 791 1/2", 792", 792 1/2", 793", 793 1/2", 794", 794 1/2", 795", 795 1/2", 796", 796 1/2", 797", 797 1/2", 798", 798 1/2", 799", 799 1/2", 800", 800 1/2", 801", 801 1/2", 802", 802 1/2", 803", 803 1/2", 804", 804 1/2", 805", 805 1/2", 806", 806 1/2", 807", 807 1/2", 808", 808 1/2", 809", 809 1/2", 810", 810 1/2", 811", 811 1/2", 812", 812 1/2", 813", 813 1/2", 814", 814 1/2", 815", 815 1/2

TO INSURE PROPER CREDIT THIS SLIP MUST ACCOMPANY
RETURNED GOODS.

OFFICE COPY

DANCER BROGAN COMPANY

"LANSING'S LEADING STORE"

Lansing, Mich., _____ 192__

Purchased by _____

Address _____

Deliver to _____

CLERK	DEPT.	FLOOR	AMOUNT REC'D
-------	-------	-------	--------------

CASH	CHARGE	C.O.D.	APPROVAL	CREDIT
------	--------	--------	----------	--------

1			

CASH

PRESENT TO STAMP WINDOW—
FIRST FLOOR, FOR PURPLE STAMPS

251958

No. A50022

Figure 91a: The autographic register system also simplifies record-keeping of transactions. It lends itself to any retail business. The forms illustrated here and in 91b show how stores use the autographic form in quadruplicate and triplicate. An explanation of the systems used in conjunction with these forms is given on page 269

[illegible]

Figure 91b: This is the triplicate form referred to in Figure 91a and of which a detailed explanation is to be found on page 269. The form illustrated here shows how a radio store uses the autographic form in triplicate. This system can be applied to a wide range of retail, wholesale, and general lines of business.

GUARANTY TRUST COMPANY OF NEW YORK

CUSTODY DIVISION

Vault Officer and Vault Clerk	No 10030
-------------------------------------	----------

Please withdraw from Account No. _____

In name of _____

Securities stated below
For delivery according to instructions _____

Withdrawal Authorized _____

ORIGINAL TO AUDITOR				Delivery Teller
Noted and Approved	Withdrawn from Vault	Entered Vault Reg.	DATE	
Lodger Clerk	Vault Clerk	Vault Officer		

6-21 18505
49-A-55

Figure 92: A simple and effective way of safeguarding the securities held in deposit vaults is by means of the autographic register form. Patrons of the bank are protected by written receipts, as the receipt is a protection against any unauthorized person's securing possession of property held in the safety deposit vaults. See page 271.

tection, convenience, and efficiency, and save considerable time and money.

Lack of space prevents a detailed description of all practical uses of the autographic register, but in order to demonstrate its remarkable versatility, a few of its applications will be given here. Autographic registers are very generally used for the issuance of bills of lading, requisitions of all kinds, receiving forms, shipping records (freight, express, and parcel-post), stock-keeping records, cost records, billing and delivery records, invoicing, and so forth, both for wholesale and retail purposes (see Figures 87, 88, and 89).

Schools, colleges, penal institutions, municipal, state, and federal offices are conducted on a business basis, which necessitates the use of initial records of business transactions, and, therefore, such institutions have a wide need for auto-

MAPLE CITY AUTO CO. ALBION, MICH.			REPAIR ORDER		Job No. <u>05059</u>	
Model _____			License No. _____		Insp. Report No. _____	
Owner's Name _____			Date _____ 192		Completed _____ 192	
Address _____			Phone _____		Invoice _____ 192	
Frame _____ Motor _____			Mileage _____		Entered _____ 192	
Deliver to _____			Promised _____ 192		Delivered _____ 192	
To _____						
FOREMAN FILL IN			INSTRUCTIONS			
LINE	EMP. NO.	OPER. NO.	ITEM			Material Change
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
READ CAREFULLY						
Storage is charged beginning five days after notice by mail to owner's address as given above. Parts not shown will not be returned as customer's property. The Maple City Auto Co. does not assume any responsibility for any loss or damage through fire, theft, accident, delay in working, replacement parts or accessories, or other causes beyond its control. Customer's cars are shown for test purposes at owner's risk. The Maple City Auto Co. is hereby authorized to furnish all necessary materials and labor to make repairs as shown.						
SIGNED _____				CUSTOMER _____		
				Totals		

OFFICE COPY

Figure 93: The original of this form is an authorized order for automobile repairs. On the reverse side of the form is an itemized statement of cost. The duplicate is the office copy, and the triplicate is the shop order. Just how each of these orders is used is described on page 271.

control their initial daily transactions in a practical, business-like manner with the aid of the autographic register. Figure 90 presents one form which is used in factories for orders.

Retail stores use forms such as shown in Figures 91*a* and 91*b*. The original or first copy is the office copy which is sent to the cashier with every charge or cash sale or money received on account. They are checked up in numerical order and any missing tickets are noted. The tickets are then placed in separate binders for cash, charges, and money received on account. All postings and bookkeeping records are made from these copies.

Copy Number 2 is the customer's copy and is always wrapped with goods. Copy Number 3, when form is in quadruplicate, is the department copy and is retained at the side of the register on a post binder. It is held there in case goods are returned or in case the cashier's check-up shows one of the original copies missing. The fourth copy is the audit copy which is retained in the register under lock and key. It is referred to in case the first or third copies are missing. They are removed from the record compartment daily and filed. At the end of every thirty days the auditor checks on cash sales, charges, and money received on account. This copy is also used for buying, each department checking from this record. This copy clearly shows what goods are selling and what goods are not.

When the form is in triplicate, copy Number 3 is the audit copy and it is retained in the register.

Banks use the autographic register systems to advantage to facilitate the proper handling of notes purchased by banks at a discount and due for payment. Ten to twenty days before a discount note is due the forms are written out and the original notice is mailed to the debtor. The duplicate is filed by date due, at the collection window, and the triplicate is retained for use by the discount committee or other bank committees for compiling information, making lists of notes due, and other purposes. The quadruplicate is held

YOUNG MEN'S CHRISTIAN ASSOCIATION

OF THE CITY OF NEWARK, NEW JERSEY

107 HALSEY STREET

25493

Newark, N. J., _____ 192_____

Received from

CASH ON ACCOUNT OF ITEMS AS SHOWN BELOW

	SUSTAINING		
MEMBERSHIP	FULL		
	LIMITED		
	PARTIAL PAYT.		
Donations			
Locker			
Dorm-Room No.	To		
Educ. Fees			
Soap and Towels			
Candy			
Pool			
Miscellaneous			
	TOTAL		

1 Y. M. C. A.. By _____ SECRETARY

in an alphabetical file at the window designed for note payments. When the note is paid, proper entries are made on the slip which serves as a ticket for the money received.

Banks have other uses for autographic register systems. Forms are also designed to afford a simple and effective way of safeguarding safety deposit vaults with receipted tickets. Patrons of the bank are protected by written receipts, as the receipt not only shows the money paid to the bank for rent, but is also a protection against any unauthorized person's securing possession of the property held in the safety deposit vaults.

Three tickets are used when one system takes care of safe rents, charges for lost keys, jimmied locks, and for safe-keeping of larger packages. The original goes to the customer as a receipt; the duplicate is turned over to the cashier each day with the money collected; and the triplicate is placed in a binder at the vault desk in numerical order.

By arranging the printed form to accommodate a number of transactions from one location point, a great deal of time can be saved. As only one set of consecutive numbers applies, they can all be filed on the same binder and reference to any of the receipts will be but a moment's work. This system is a combination safeguard for the bank's patrons and a time-saver for the bank.

The service performed by autographic register systems in garages is quite broad and includes a number of applications or purposes. Besides such services as recording sales of parts, accessories, and supplies, they are used for requisitions on the stock-room, purchase orders, and shop repair orders. The latter is shown in Figure 93. The original is a detailed authorization over the customer's name for the work to be done, as well as an invoice when completed. On the reverse side is a form for an itemized statement of costs, if the customer desires it. The second copy—frequently on colored paper—is the office copy. It can serve as a tracer of the job and a record of progress. On the reverse is a form for the recapitulation of all time and material charges.

The third copy—the shop order—is on substantial manila, to stand rough handling. It accompanies the car into the workroom and becomes an instruction sheet for the foreman and the mechanics. On the reverse is another space for recording the time of different workmen and all material used. From this is made the recapitulation for the office copy and an accurate check against stock-room and tool-room inventory. A similar system provides for a separate requisition on stock-room, if desired.

Autographic register systems are designed for use in government (federal, state, city, and county) offices. Forms are often used in connection with a cash register, and the citizen's receipt written by the auditor and recorder's deputy is not valid unless stamped "Paid" in the upper margin. This is done in the cash register¹ after the tickets have been extracted from the autographic register.

An important use of the autographic register is in public utilities offices. Patrons, through lack of individual checking or through forgetfulness, are prone to file complaints regularly on receipt of their monthly bills. To guard against this it is essential that both the utility company and the patron hold a record of payment to avoid repetition of bills and misunderstanding.

Four tickets are written. The first is given to the patron as a receipt. The second goes to the cashier, and at the end of the day the amounts are added to show the total of cash received. The third ticket is sent to the billing clerk as a record of the transaction. The fourth ticket is retained in the register as a check-back or secret record. This record is in a continuous strip and shows the entire record of sales for a day or week as may be required. The forms are numbered consecutively and can be filed in strict numerical order. They are distinguished by large skeleton figures.

Figures 94 and 95 show how an autographic register system may be used in hospitals and in associations such as

¹A detailed description of the cash register will be found in Chapter XVI.

the Young Men's Christian Association. Hospitals deal with a variety of persons; consequently they require a system which will promote good-will and at the same time provide for an absolute protection of business interests. The system used requires three copies: one for the office, one for the patient, and one for reference. The reference ticket insures a check on the other two tickets, and should the ledger be posted irregularly or a misunderstanding arise between the patient and the institution, there remains a copy of the transaction. As a third copy is not accessible to any one except the person holding the key, it cannot be tampered with.

When the autographic register is combined with a cash drawer it becomes a distinct unit which provides a means of handling cash. How this combination is effected is described in the following chapter.

XV

AUTOGRAPHIC CASH REGISTERS

What the autographic cash register is. Important features of the autographic cash register. The two types of registers: automatic type; key release or plunger type. Advantages of autographic cash registers.

FROM the autographic register has developed an office equipment—the autographic cash register—which fills an important place in the business needs of the average merchant. This device, which may be termed a combination of an autographic register and a cash drawer, furnishes a protection and safeguard for every transaction. In short, it combines into practically one operation the recording of the sale, or other transaction, with the accompanying handwritten sales ticket, the recording of a copy of the transaction on a concealed record, and opening the cash receptacle for depositing the money received. Although the autographic cash register is a combination of the autographic register¹ and a cash drawer, in its construction it is a distinct unit, the two features working in unison and consequently enforcing a great degree of protection to the merchant's interests.

The illustration in Figure 96 shows how the autographic cash register is used. The cash drawer can be arranged to handle the autographic register forms as well as cash. The autographic cash register has a definite field for its application. Perhaps the greatest benefits are obtained where the requirements call for recording the details of a sale, where it is customary to write a separate record either in a sales-book pad or ledger. The autographic cash register is

¹Chapter XIV, Autographic Registers, should be read in conjunction with this chapter.

not equipped with an adding device or other means of totaling the sales. In fact, its general utility was not intended as a substitute for the cash register, but rather to develop and improve the protective advantages of handwritten records of sales transactions.

IMPORTANT FEATURES OF THE AUTOGRAPHIC CASH REGISTER

The autographic cash register has all the features of the autographic register, with important additional characteristics, such as the cash drawer, single and multiple drawer cabinets, and the counter mechanism. In general, the style of the cash drawer depends largely upon individual manufacturers, the size of the register, and the kind of business to be served. The cabinets are made in steel as well as various woods, such as mahogany, walnut, and oak, and vary in size according to the model with which they are combined. The interior of the drawer is usually divided into small tills for coins, compartments for bills, and space for the retained copies of the sales slips issued. The number of compartments ranges from six to twelve, and they are arranged in various forms, as, for instance, three for bills and three for coins; or two for bills, three for forms, and the remaining for coins. For holding the paper money and forms in place a spring or weighted wire may be used in the bill and form compartments.

The cash drawers are equipped with a key lock operated separately from the connection between the register and the drawer. In some cases the entire till tray may be removed and placed in a safe or vault at night. In other cases the till trays are made in sections which may be removed separately, or a metal box is provided, serving primarily as a receptacle for the sales tickets, but which may be removed for storing both tickets and currency in the safe. Some of the manufacturers build equipment with multiple drawers, each drawer being selective in operating the register. In short, there is quite a wide variety in the styles and ar-

rangements of the cabinet sections, depending upon the manufacturer.

To the regular equipment may be added a counting device which keeps a record of the number of times the cash drawer is opened. As the drawer opens, the counter automatically adds one.

THE TWO TYPES OF AUTOGRAPHIC CASH REGISTERS

Since the autographic cash register is a combination of autographic register and cash drawer it naturally follows that there are three styles of recording registers: the manifold, which issues all copies from the machine without re-



Figure 96: When an autographic cash register is used, the forms may be filed in a compartment of the cash drawer. The recording of the sale on the register, the issuance of the form, and the filing of the slip can be accomplished in a few seconds. See pages 274 and 275.

taining a concealed copy; the recorder, which, in addition to the two or three tickets issued, rewinds or retains a copy inside the machine; and the summary style, which issues two or three copies of the tickets and retains a record showing the totals only of the transactions, which are divided into columns according to specified classifications. When these three styles are combined with the additional features of the autographic cash registers, then a further classification may be made, according to the way the cash drawer operates in relation to the recording device. According to this classification there are two types of autographic cash registers—one, the automatic, and the other, the key release or plunger type.

*Automatic Type.*¹ When the operation of the register and the opening of the cash drawer are synchronized—that is, when the register is so operated that the cash drawer opens automatically, then the register may be called the automatic type of autographic cash register. When the forms are propelled from the recording device by handle or crank, the drawer opens automatically, which means that the issuance of forms is compulsory to the opening of the cash drawer.

Figure 97 represents the autographic cash register of the automatic type. In illustration A, note the open cash drawer and the small counting device just above the drawer on the left-hand side. This is the device which shows how many times the drawer has been opened. Illustration B represents the register which is self-printing.

*Key Release or Plunger Type.*² When a release key or

¹Autographic cash registers of the automatic type are manufactured by such companies as American Sales Book Company, Limited; Egly Register Company; The Globe Register Company; Multi-Print System Company, Inc.; Standard Register Company; and United Autographic Register Company.

²The key release or plunger type of autographic cash register is manufactured by such companies as American Sales Book Company, Limited; Egly Register Company; The Globe Register Company; Standard Register Company; and United Autographic Register Company.

plunger is added to the equipment, so that the cash drawer may be opened without the issuance of the forms, then the register may be termed a key release or plunger type register. When it is necessary to open the drawer, the "no-sale" release key or plunger is depressed, which may be done at any time, whether or not a set of tickets is issued from the register. Therefore, the register and drawer may operate either in unison or as separate units without affecting the other.

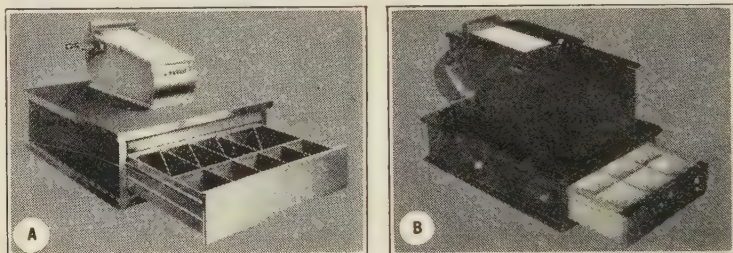


Figure 97: The two autographic cash registers shown are automatic. Note the adding counter above the cash drawer of illustration A. This device records the number of times the drawer is opened. The register in illustration B prints the forms as it is operated. See page 277.

The "no-sales" key release or lever may be equipped with a lock, so that the issuing of tickets and the recording of transactions can be made compulsory to the opening of the drawer whenever desired. But when this lock is released, the drawer can be opened without issuing forms from the register.

Figure 98 represents autographic registers of the key release or plunger type. Note the plunger which is shown in illustration A of Figure 98. The register in illustration B of Figure 98, also a plunger type, represents another total summary type of register, as does also the illustration in Figure 99. The cash drawer opens only when the handle of the register is operated.

There are two types of registers¹ which are decidedly

¹Manufactured by such companies as Standard Register Company and the Morris Register Company.

different from the registers previously described (see illustrations A and B of Figure 100). The register shown in illustration A consists of an autographic register and cash drawer combined. In the lid of the cash drawer cabinet is an aperture through which a record of the transaction may be written upon a roll of blank paper which is contained within the cabinet. Instead of issuing any sales tickets the recording device provides for a summary record only, which is retained within the cabinet. Four release buttons on the side of the cabinet provide for the opening of the cash drawer. As the drawer opens, the written record automatically rewinds and is retained within the cabinet, so that if the cash drawer is opened when no sale is made, the record sheet moves forward one space without carrying a record.

The register represented by illustration B of Figure 100 issues four tickets of receipts for cash, paid-out, received-on-account, and charge sales. An aperture provides space for noting the amounts on each ticket. A roll of these tickets—each a different color—is contained in the register. A fifth slot offers a space for writing memos, such as merchandise purchased or name of customer. A reproducing device affords a means of retaining a record of all transactions on a special roll or so-called daily-record sheet. The register has no adding device, but the record sheet may be removed and totaled at regular scheduled periods. By oper-

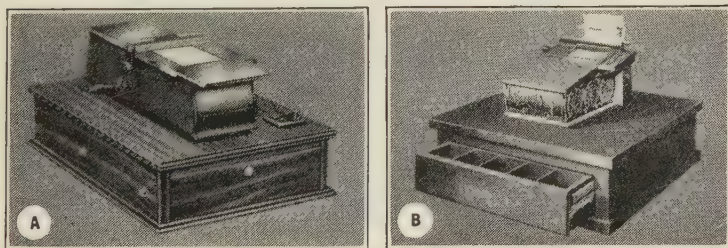


Figure 98: When a plunger type autographic cash register is used, the cash drawer may be opened without registering a transaction. Note the position of the plunger in illustration A. The register in B, also a plunger type, represents another total summary type of register. See page 278.

ating the lever specifying the kind of transaction, a receipt may be issued. The cash drawer cannot be opened unless a transaction has been registered.

THE ADVANTAGES OF AUTOGRAPHIC CASH REGISTERS

The scope of the autographic cash register in the retail field is very broad. The retail sales ticket system requiring a handwritten record of every transaction is generally recognized now as an important, if not essential, detail of every retail business. In no other way can the merchant secure the records that are so essential and at the same time protect himself against carelessness, fraud, and inefficiency on the part of his clerks. In combining a system

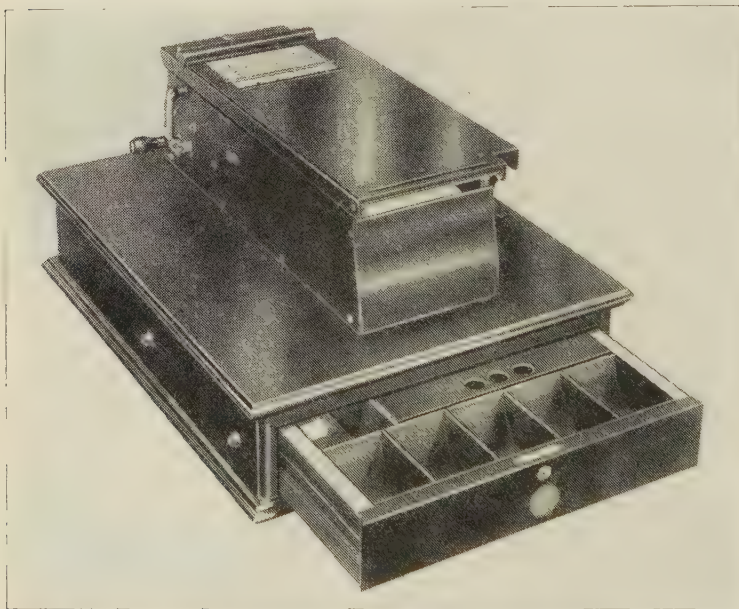


Figure 99: The above register, which is of the optional receipt type, shows another style of total summary register. The handle automatically opens the drawer and does not require or make possible a separate operation for this purpose.

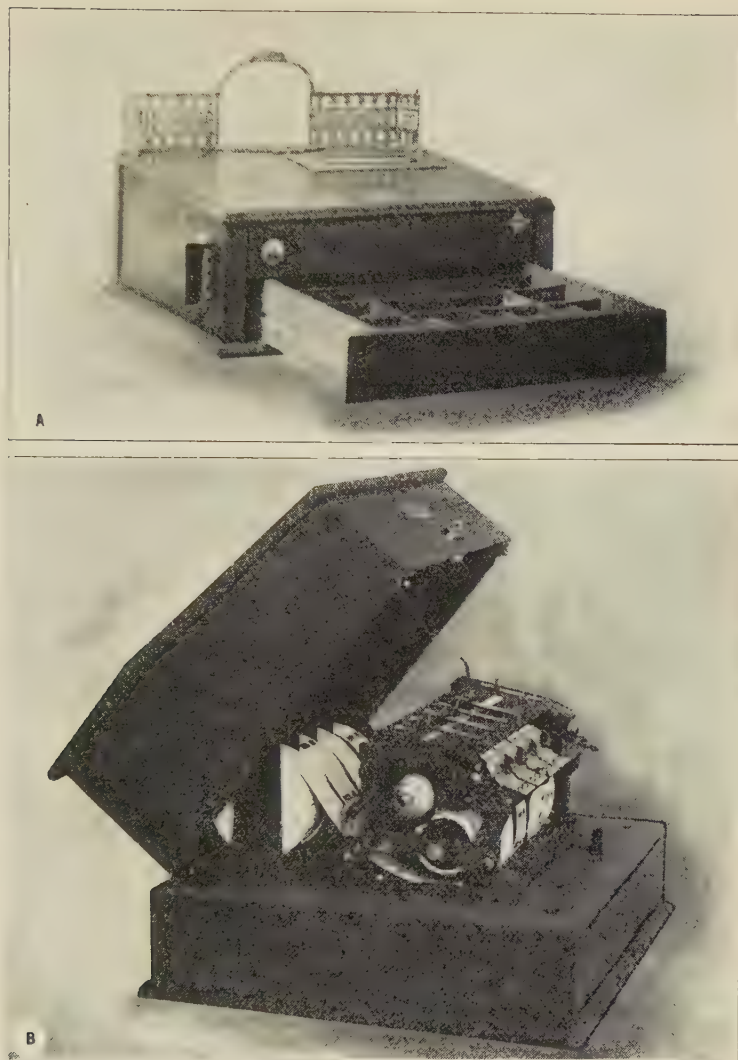


Figure 100: A summary record of every transaction is retained by the autographic cash registers represented here. Illustration A pictures a register which does not issue a copy of the record made. Illustration B shows a register which issues four receipts and retains a copy of all transactions.

See pages 278 and 279 for details.

of this kind with the cash drawer itself, the value of the equipment is apparent. The retained copy which is under lock and key cannot be tampered with after the transaction has once been recorded. It is of great assistance in maintaining inventory records, costing the sales, checking against reports of goods returned, articles sold by each clerk, and whether the articles have been correctly priced. In short, it offers, in clear, clean-cut style, the means of a thorough analysis by the merchant of just what results he is obtaining from each clerk and from each department. In addition, it is possible to carry a credit system and a cash system simultaneously on the same equipment with equal efficiency in each case.

Briefly summarized, the advantages of the autographic cash register are the following: It provides, first, a sales ticket for the customer, making him a witness to the transaction; second, a copy for the cashier or bookkeeper to be used in checking the cash; and third, a retained record which serves as a check on both the other copies. Any class of transaction can be handled with this equipment, which means that it centralizes all cash business, fixes responsibility, and gives a better check on all transactions.

XVI

CASH REGISTERS

Old systems of recording cash transactions. Why such systems were inadequate. A merchant's invention. Characteristics of the modern cash register: indication; adding and counting mechanism; cash drawer and bell; keyboard; printed detail strip; printed receipt. Classification of modern cash registers. Non-printing type: key-set non-printer; lever-set non-printer. Printing type: total printer; detail printer; detail and receipt printer; detail-total printer; multiple accumulative total printer. The scope of the cash register field.

THE most important transaction in a retail store is the sale. The merchant is in business to make sales, and in order to win and hold the confidence of his customers he must give them two things—quality of goods and quality of service. The cash register system provides one means of giving “quality service.”

The old-time shopkeeper had a very rudimentary system of control over cash receipts—the old-fashioned money drawer. He kept no sales records whatsoever. Eventually, however, merchants adopted the system of recording in a day-book the transactions handled in the store, but even for the one-man shop this proved to be insufficient. And as the shops grew into stores, with bigger stocks of goods and several clerks, it became impossible for the merchant personally to handle and record every transaction in his business.

The merchant then began to realize that he needed a record which would prove the daily totals of business done, provide information regarding cash taken in and paid out, and help him adjust any disputes which might arise. He had learned from past experience that he was likely to make mistakes in recording transactions or to forget to record some of the sales. He knew that if he, as proprietor, made these mistakes and forgot to make records, it was very likely

that his employees would do the same. And if records were made accurately, items hastily written down in the rush of selling were difficult to read later in the day.

Another problem confronted the merchant. The uncounted money in the unprotected cash drawer presented a great temptation. Such a condition naturally created suspicion of his clerks in the merchant's mind. A spirit of distrust between the merchant and his clerks spread to the minds of the customers. It was difficult, however, for the merchant to realize that these troubles were the direct result of an inadequate, inefficient store system. Not until the latter part of the nineteenth century was any attempt made to find an automatic means to make and keep sales records, and also provide a system that would prevent loss of time, work, and money in retail stores.

A MERCHANT'S INVENTION

It seems fitting that a merchant should have been the first to invent a device which keeps records of cash sales. In 1879 James Ritty, a merchant, took a voyage to Europe to

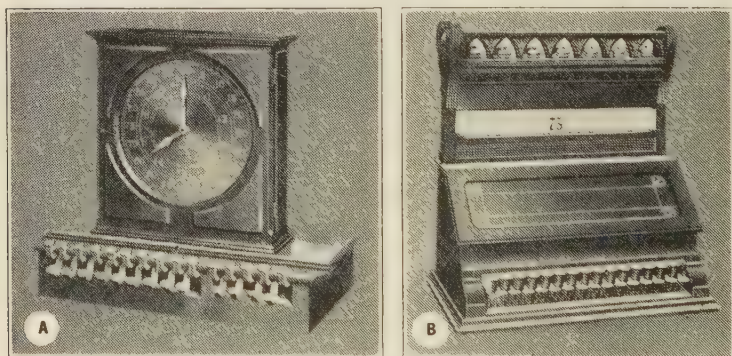


Figure 101: Two interesting steps in the cash register development are presented here. Illustration A, one of the earliest models, shows the unique indicator which was first used. Illustration B, one of the first practical cash registers, reveals the fact that the cash drawer was a later development. For full details, see page 286.

get away from business worries. He visited the engine room of the vessel on which he was a passenger and noted particularly the indicator which tallied the revolutions of the propeller shaft. He thought that the working principle of this device could be developed into a machine to keep records of cash sales in his own business. In fact, he became so interested that he returned to the United States to work out the idea. He and his brother, who was a mechanic, built a machine which they called a cash register. It was a crude mechanism, but nevertheless, it provided features which were granted basic patents and which became the fundamentals of the cash register.

The first practical cash register was known as the paper-roll machine, for in the wooden cabinet of the register there was enclosed a roll of paper ruled in columns—a column for each key. When a key was pressed, it punched a hole in the corresponding column of the roll, rang a bell, and raised the indicator to show the customer what amount had been registered. To find the total of business done, the proprietor unlocked the cabinet, removed the paper roll, and counted the holes in each column. He then multiplied each number by

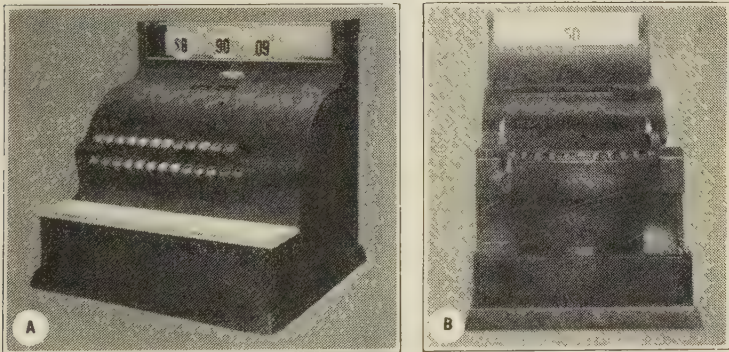


Figure 102: The two non-printing cash registers shown here provide a total record of all transactions registered. Note that the key-set register, illustration A, is equipped with a two-row keyboard, while the lever-set register, illustration B, is equipped with a unique keyboard and a lever which operates it. See pages 293 and 294.

the figure represented by the column and struck a total which gave the amount recorded and the cash which should be on hand.

While the credit for the actual idea of the cash register must go to the first merchant inventor, it remained for another merchant, John H. Patterson, to improve the invention and develop the cash register industry. As a result of trying out, in his own store, two of the first cash registers, Mr. Patterson saw that this new invention was destined to fill a great need in the retail stores of the world, and he decided to go into the cash register business.¹

In 1884 Mr. Patterson put men on the task of improving the indication and equipping the register with a cash drawer. The paper roll was changed to an adding-wheel device that read directly in dollars and cents. This improvement was soon followed by a total-adding device which showed, at a glance, a total of all cash received. Figure 101 shows two very interesting developments of the cash register. Note the clock-face dial—in illustration A—which indicates dollars and cents. Illustration B shows a register equipped with many of the important features of a modern cash register: keyboard, indicator, and bell. No cash drawer was furnished with this model.

A later development of the cash register was a printing attachment which was called the detail strip. This strip provided a private, printed record of each transaction. Other developments which came much later enabled the merchant to give his customers a printed receipt, equipped the cash register with more than one total, and added to the cabinet more than one cash drawer.

CHARACTERISTICS OF THE MODERN CASH REGISTER

Improvement followed improvement to meet the demands

¹Readers who are interested in the cash register development should see the "Biography of John H. Patterson," by Samuel Crowther, which was published in serial form in *System, the Magazine of Business*, and which is now published in book form by Doubleday, Page & Company.

of merchants in different lines of business. The first machine recorded cash sales only. Today, however, a merchant and his clerks can use the cash register to record charge sales, as well as cash sales, also received-on-account, paid-out, and other transactions. The latest improved cash register also mechanically classifies records by departments and by individuals.

As the manufacture of cash registers by various companies continued, there was a marked adherence to the general form, but with variations and distinctive features. Some of these important characteristics are the indication, the adding and counting mechanism, the cash drawer and bell, the keyboard, the printed detail strip, and the printed receipt.

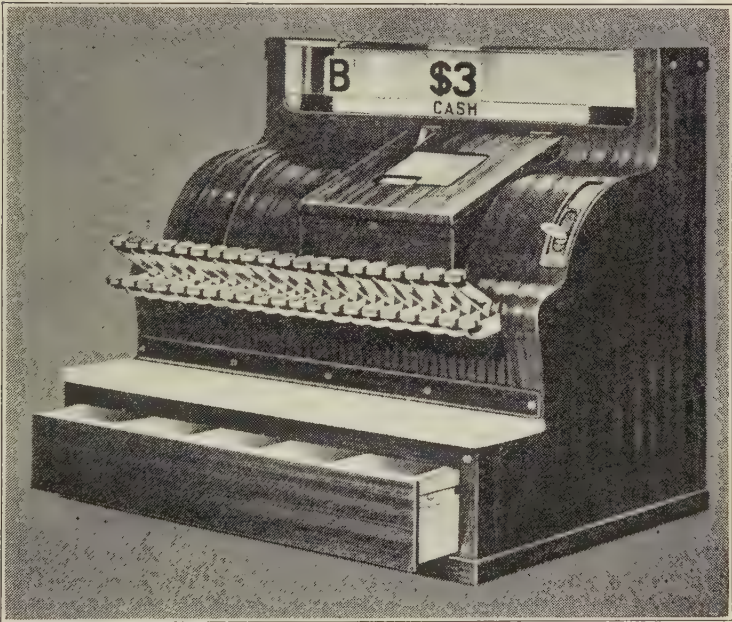


Figure 103: The printing cash register shown here provides a record of the total of sales, and additional information, such as the date, number of transaction, number of times the "no-sale" key was used, and so forth. An interesting feature is the device which makes it possible to file each day's record. See page 295 for particulars.

The Indication. At the top of the cabinet of every cash register there is a glass case in which are enclosed indicators or placards representing the figures on the keys. When a key is pressed, the indicator appears in the case, thus showing in plain figures the amount of sale. The publicity of the indication has a strong moral effect on the salesperson, and thus it tends to enforce correct records, as it remains



Figure 104: With this cash register a detailed printed record may be secured. The keyboard is operated by pressing in the keys instead of depressing them as with the cash registers represented in Figures 101, 102, and 103. Also notice the autographic device. See pages 295 and 296.

in view until the next sale is made. Before the invention of the cash register, store records were made without the inspection of the merchant or the customer. By means of the indication the merchant can supervise all sales records. Under the old method the accuracy of the record depended entirely upon the salespeople. Even though records were accurately made—and often they were not—many times they became lost or were destroyed. The indication, as a part of the cash register, provides a means of proving a salesperson's accuracy and honesty. Moreover, it assists the salesperson in making correct change and enables the customer to determine that the sale has been properly recorded.

Adding and Counting Mechanism. Encased within the cabinet is a device which records the total of each transaction and also shows a counted record of the number of transactions handled throughout the day. This mechanism is locked inside the register so that only the proprietor—or a person authorized to do so—can see the amount. This is done by lifting the guard or cover of the register. It is a great convenience in balancing up a day's business, as it

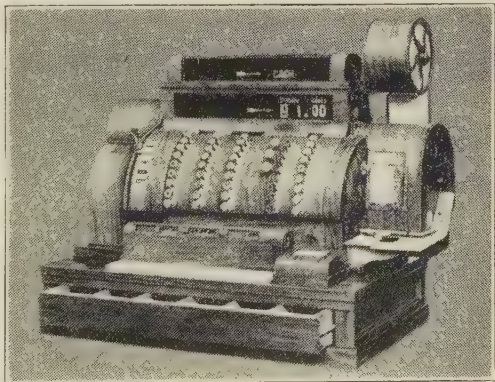
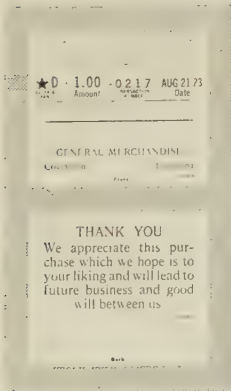


Figure 105: A cash register which prints a detailed record of transactions and which also issues a receipt is illustrated above. The numerous interesting features make it possible to install a complete accounting system. Notice the receipt or sales-check which is automatically printed and issued by this type of cash register. See pages 296 and 297.

provides a mechanical control over the amount of money which should be turned in and the number of sales-slips which should be in the drawer. These added and counted records protect the merchant's money against loss through carelessness, forgetfulness, or temptation. They provide him with information regarding the money received, the condition of his accounts receivable, the amount of his disbursements, the amount of money that he should deposit in the bank, the ratio of credit business to sales volume, the number of customers served, the amount of his average sale per customer, and other information regarding his store transactions.

The Cash Drawer and Bell. The cash drawer, protected by the automatic ringing of the bell, provides a convenient means of taking care of cash. This important feature is operated automatically by the amount keys when a sale is registered. As the drawer opens, a bell rings, thereby sounding an alarm and announcing that some one is operating the cash drawer.

The multiple-cash-drawer feature, one of the latest developments of the cash register, places full responsibility upon each individual who makes the store records, handles money, makes change, and pays out money. Besides eliminating the possibility of unjust suspicion, which may arise when several persons use the same cash drawer, the element of personal pride is aroused by means of the multiple-cash-drawer feature. When each salesperson is responsible for his own cash drawer, he realizes that the system offers a close check-up on personal ability and accuracy. This fact gives him a new incentive to become both efficient and competent.

The Keyboard. The keys representing money values vary in number, arrangement, and operation. When arranged horizontally in two banks, the keys are operated by a downward stroke; when in vertical arrangement, they are operated by pressing or pushing in. The keyboards of different models vary in number and kinds of keys. Some models

have special keys, such as, no sale, cash sale, void, received on account, charge, paid out, and so forth.

The Printed Detail Strip. The printing device offers a permanent record from which the merchant can determine the exact amount recorded for a particular sale. Some types of cash registers are equipped with wide strips of paper, which furnish space for additional information regarding a transaction. At the end of the business day the detail strip can be dated, placed in an envelope, and filed for future reference. This record, printed in detail, is of great value in tracing any particular sale, locating a lost sales-slip, and proving the volume of business done. It provides a check which accountants call an "internal check" on original entries. The detail strip is of further value, especially when codes or symbols are used with each sale to denote the salesperson, kind of transaction, merchandise, or departments.

The Printed Receipt. The receipt which is given to the customer shows the amount of the sale, the salesperson's initial, the sale number, and the date. It is a movable form of publicity and can be given to the customer for personal inspection or wrapped with the goods to go directly into

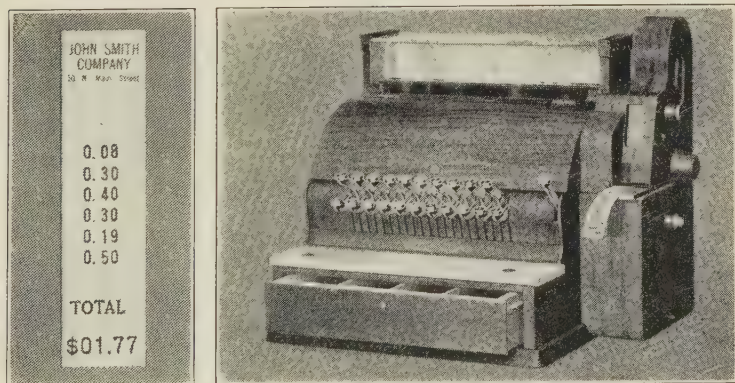


Figure 106: The printing register illustrated here issues an itemized and totaled receipt such as shown to the left. See page 297.

the customer's home. For transactions that require a sales-slip, a slip-printing register prints the same information on both the original and duplicate copies of the sales-slip. This printed, indelible record assures the merchant that the store's copy of the sales-slip is a duplicate of the record given to the customer. The plan of getting or giving a receipt, according to the different kinds of transactions handled, makes clerks careful, removes temptation, and enforces accurate records. It also prevents paying a bill the second time, and furnishes the original entry, which is unchangeable and easily read, and which, if mislaid or lost, can be

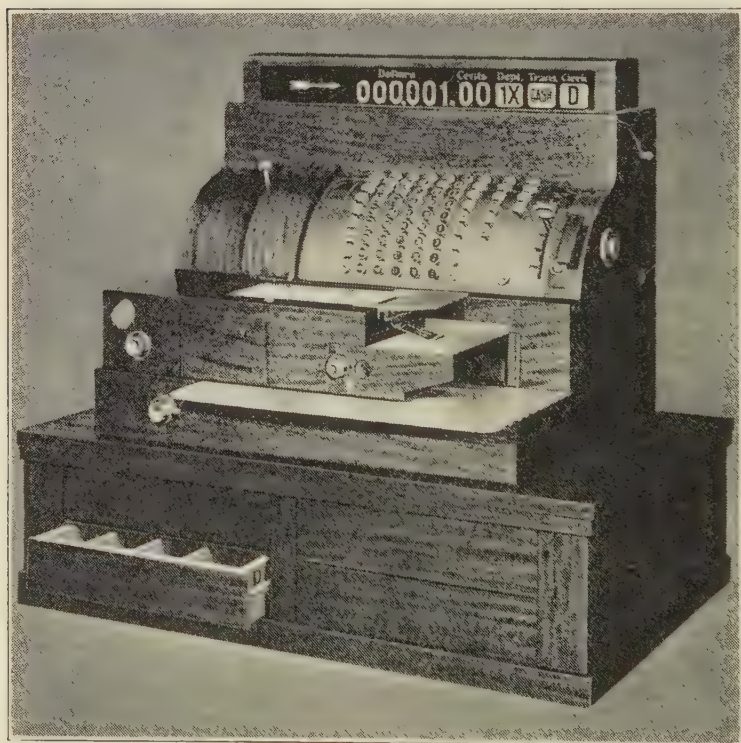


Figure 107: As many as 30 totals may be secured by this accumulative total printer. Furthermore, the multiple cash drawer feature offers separate cash drawers for as many as nine salespersons. See pages 297 and 298.

traced by other added and printed records in the machine.

CLASSIFICATION OF MODERN CASH REGISTERS

Because there are many varieties of cash registers on the market it is impossible to take up each one separately. Since all of these varieties are composed of the basic characteristics, the combination of additional features classifies them in two groups: one, the non-printing type; the other, the printing type. In both cases the same general principle of construction is followed, each type being distinctive because of special combinations of features which form different kinds for particular purposes.

NON-PRINTING TYPE¹

The cash register of the non-printing type is of two kinds, the key-set and the lever-set. Each kind is made up of the four basic characteristics—the indication, the adding and counting mechanism, the keyboard, and the cash drawer and bell. The two illustrations shown in Figure 102 illustrate the cash register of the non-printing type. In each case the adding and counting device provides a total record which may be read at any time through the slot or apertures in the face of the cabinet. These slots are equipped with shutters or blinds which are controlled by the proprietor's key. A reset mechanism adds one each time the adding-counting mechanism is reset to zero, thus preventing any unauthorized person from resetting the counter.

*Key-Set Non-Printer.*² In addition to the basic characteristics the key-set non-printer is equipped with a drawer release which is operated by a special release device. The keyboard has a double bank of keys horizontally arranged.

¹Manufactured by such companies as Federal Cash Register Company; The National Cash Register Company; and St. Louis Cash Register Company, Inc.

²Manufactured by such companies as Federal Cash Register Company and The National Cash Register Company.

Each key represents amounts and in addition there are special keys, such as, no sale, and received on account. Illustration A in Figure 102 shows a non-printing register of the key-set type. The counters of this register are under lock and key.

The key-set non-printing cash register is operated automatically without a lever or crank. The keys representing the amount of sale are depressed and simultaneously the indicators appear, the adding and counting mechanism records the amount within the register, the cash drawer opens, and the bell rings.

*Lever-Set Non-Printer.*¹ The register of the lever-set kind is also built upon the basic characteristics, but has a distinctive keyboard which consists of a panel of metal on which are amounts 5 to 95. Beneath the keyboard is a single operating key or lever. Illustration B of Figure 102 pictures the lever-set non-printing type.

The register of this kind is operated by moving the lever along the keyboard to the figures representing the amount of sale. The "no sale" key is at the extreme left of the keyboard; "dollars only" and "cents only" are registered on "X" position at the extreme right. All sales in 5-cent multiples below \$1 are registered with the single operating key. Sales amounting to dollars and cents are registered by setting the side lever before depressing the operating key. As the cash drawer opens, the lever returns to the original position.

PRINTING TYPE²

There are five kinds of printing cash registers: the total printer; the detail printer; the detail and receipt printer;

¹ Manufactured by such companies as St. Louis Cash Register Company, Inc.

² Manufactured by such companies as The National Cash Register Company and Remington Cash Register Company, Inc., subsidiary of Remington Arms Company, Inc.

the detail-total printer; and the multiple accumulative total printer. Each of the five kinds is composed of the four chief characteristics—the indication, the adding and counting mechanism, the keyboard, and the cash drawer and bell. In addition to these characteristics, there are distinctive features which characterize them as to kind. Figures 103, 104, 105, 106, and 107 show a group of printing cash registers illustrating the five different kinds of this type.

*The Total Printer.*¹ The total-printer type of cash register provides a total record which may be printed at any time upon a slip of paper. In addition to the total of sales, there are printed on the slip the date, the number of transactions, the number of times the “no-sale” key was used, the number of times the adding and counting mechanism was reset to zero, and the number of the machine when more than one register is used in the same store or chain of stores. At the end of the day the printed slip may be filed as a permanent record of the day’s business. The adding and printing mechanisms, as well as the resetting device, bell control, drawer release, and so forth, are locked under a hood which fully protects them from unauthorized persons. Figures 103, 104, and 107 illustrate the total-printer type of cash register.

*Detail Printer.*² The detail strip which the printer prints shows the amount of sale of each item, the nature of the transaction, and the salesperson’s initial or department symbol. When the wide detail strip paper is used, enough space for handwritten memorandums is provided at the side of each item. The register of this kind is equipped with one or two total-adding counters which print the total of the accumulated amount. Each counter has resetting devices, and special counters may be provided to give the number of each

¹Manufactured by such companies as The National Cash Register Company and Remington Cash Register Company, Inc., subsidiary of Remington Arms Company, Inc.

²Manufactured by such companies as The National Cash Register Company and Remington Cash Register Company, Inc., subsidiary of Remington Arms Company, Inc.

transaction. The total-adding counters also print the amounts instead of recording them on steel wheels.

If you compare the illustration in Figure 103 with that in Figure 104, you will note the difference in the keyboards. Figure 103 has keys which are pressed down when operated, while Figure 104 has keys which are pressed in when operated. The push-in key type is operated by setting up the amounts on the keyboard, and then depressing a bar or lever at the right of the keyboard (see Figure 104). The nature of the transactions is indicated by pressing the proper key—paid, charge, received on account, and so forth.

*Detail and Receipt Printer.*¹ The detail and receipt printer is composed of the same characteristics and features as the detail printer, but has in addition the receipt-printing device which issues a ticket or receipt to the customer. The receipt bears the total of sale, transaction number, and date of sale. In addition to the two distinctive characteristics—the detail and receipt printers—this register has other important features, such as the multiple counters which provide a separate record of total transactions of more than one salesperson or department. As many as 18 separate counters may be provided. Each counter is equipped with a resetting device and controlled by a hand lever on the keyboard. Two counters can be operated at a time. When the multiple counters are featured, the multiple drawer is generally added also. As many as nine cash drawers may be added so that nine or fewer salespersons can have access to a separate drawer.

Besides the receipt and detail strip printers and many counters, two extra printers may be provided: the number printer, which prints the stock numbers, words, and various symbols, and the type of printer which permits the printing of data on inserted sales-slips. Figure 105 shows one model of a detail and receipt printer. The detail- and receipt-print-

¹Manufactured by such companies as The National Cash Register Company.

ing device is located at the right-hand side for convenience.

The detail- and receipt-printing type of cash register is operated by motor or hand power after the amount keys are depressed. In a typical department store where the clerk-wrap, open-inspection cash register system is made possible through the use of a receipt- and detail-strip-printing cash register, the salesperson presses the keys representing the amount of sale and, in the case of a multiple-cash-drawer system, touches her own initial key and releases the cash drawer. The drawer opens the moment the indicators appear and the bell rings. As this operation takes place, the adding mechanism records the amount on the proper individual counter; the separate item is printed on the detail strip and the total is given on the receipt which the printing device issues. The salesperson completes the operation by making the proper change and handing it to the customer with the receipt and the wrapped purchase.

*Detail-Total Printer.*¹ The register of this kind prints and adds the items of sale, then prints and records the total. This register retains a detail record and issues a receipt giving the itemized sales and the total. Figure 106 shows the detail-total printing register. Note the itemized and totaled receipt also which completes the illustration.

When the amount keys denoting a separate item of a sale have been depressed, they return to the original position. The indicators show the amount of each item as the amount is registered. When the total is printed, the amount does not appear in the indication; however, the last item indicator disappears as the total is taken.

*Multiple Accumulative Total Printer.*² The cash register which prints on the detail strip the amount accumulated on each total and which can have as many as 30 separate totals is here called the multiple total accumulative printer type of

¹Manufactured by such companies as The National Cash Register Company.

²Manufactured by such companies as The National Cash Register Company.

cash register. This machine is equipped with a push-in keyboard, and it also may be equipped with multiple cash drawers and multiple totals (see Figure 107). A one- or a two-part receipt may be issued as desired, and the amount accumulated on each total is printed without being cleared. The detail-strip record or audit sheet has the autographic feature which permits additional information concerning a transaction to be written under the printed record. These records are under lock and key, and are also protected so that they cannot be seen or turned to zero except by an authorized person.

The sales-slip printing device is so constructed that it will print once upon an inserted single sheet, or twice upon a duplicate form, thereby certifying both the original and the duplicate copies at one operation. The maximum printing record of this type of machine is five printings: twice on a two-part receipt, twice on a duplicate sales-slip form, and once on the detail-strip or audit sheet.

This type of cash register is operated by key control. There are no levers; any total desired can be selected by merely pressing the proper control key. When several articles are sold to one customer, a listing key is used to total the sale. Each item of the sale is added on the proper department total at the same time that it is listed. The key arrangement may be built to fit the needs of any store.

THE SCOPE OF THE CASH REGISTER FIELD

Statistics show that some 300 different lines of businesses have a need for cash registers. Since each of these different lines of business has its own specific problem and, therefore, its own specific requirements for handling cash and keeping records of sales, it is evident that one type of cash register is not suited to all kinds of stores. The large store requires a cash register system entirely different from that of the small store; a garage requires one different from that of a general store. The shoe store has a different problem

to solve by means of a cash register than has a grocery store. And so the comparison could be continued throughout the entire list of different businesses.

While these specific illustrations give a slight idea of the value of a cash register system, a comparison with the old method of shopkeeping will further show the value of the modern cash register system. The old method necessitated the day-book and furnished no absolute check on the cash; the cash register system increases profits by providing a constant check on cash, thereby encouraging carefulness in handling money, making change, and in paying out money. The old system did not protect the uncounted money; the cash register removes the temptation of uncounted money and insures the merchant a proper accounting of cash. The old system necessitated a difficult means of bookkeeping; the cash register offers a simple, up-to-date means of getting the facts the merchants need for accurate records. Moreover, the cash register system gives quick and accurate service and wins and holds the confidence of the customer. In brief, then, the cash register affords the retail merchant information, maximum protection, quick service, economy of operation, and convenience to his customers as well as to himself.

In addition to these many specific and general advantages, the cash register solves further problems of the retail merchant of today. How to obtain the correct number of stock-turns; how to get value received for the money expended for clerk hire; how to control credit business, are some of the subjects the solution of which is largely facilitated through the accurate information provided by a cash register system.

XVII

CREDIT REGISTERS

Accurate and up-to-date credit records a necessity. The first credit systems. Present-day credit systems: the daily-account type; the daily- past-account type. The value of credit register systems to business.

IN the early days of retail merchandising, selling on credit was merely a friendly accommodation. The merchant made his charge records on slips of paper and filed them on a spindle or hook. He "trusted" that his customers would pay promptly, and he also "trusted" that the record of the charge sale would not be lost.

With the growth of retail business, however, merchants began to realize that this careless handling of charge accounts was the source of frequent losses of time, good-will, and money. They felt that accurate and up-to-date credit records were an absolute necessity, and, as a result, book-keeping systems gradually were evolved for every kind of business.

But many merchants had neither the time nor the ability to keep accurately a more or less complicated set of books; they had to hire one or more persons to do that work for them. Eventually, this method proved to be not only expensive and cumbersome, but—at least as far as charge accounts go—altogether inadequate, and very often inaccurate.

A system was needed which would be safer and, at the same time, more convenient—a system which would do away with the multiplicity of entries into day-book, journal, ledger, and so forth, and, instead, provide a simple means of procuring instantly such necessary data as account number, charge to date, credit limit, due date, and so forth, without any possibility of error. This, the credit register—truly a

mechanical accountant—fulfils: it is accurate, time saving, and gives up-to-the-minute service.

THE FIRST CREDIT SYSTEMS

One of the first credit systems involved the use of a pass-book which the customer was supposed to bring to the store when buying on credit. The merchant wrote in the pass-book a record of the amount bought, and kept a duplicate record which was later on entered in a day-book, then re-written in a journal, and finally summarized or itemized in a ledger of accounts receivable.

Duplicate sales books eventually succeeded the pass-book system. A sales-slip record of the sale was given to the customer, and the merchant filed the store's copy. In some stores the old bookkeeping records were retained; in others the merchant posted the sales-slip record to the ledger. At the end of each month the merchant had to make up a statement of each customer's account, as shown on his ledger of accounts receivable, and send it to the customer.

Although credit systems of one sort or another were in limited use as early as 1883, and while several systems were patented¹ between that year and 1903, it seems sufficient to begin with the development begun at this later date. In 1903 a group of men² got together in order to work out a practical plan and a working organization to fulfil this recognized need. The result was a system which was housed within a cabinet or register, in which sales slips bearing the single entry of each credit sale were filed.

The early file cabinet was operated by the use of multiple sales books with either duplicate or triplicate sets of slips which were printed on a small, flat-bed press. The mer-

¹Any reader interested in going into this early development in detail should look up patents Number 289,569, Number 329,676, Number 351,694, Number 352,036, Number 35,806, and Number 396,926.

²This group of men founded The McCaskey Register Company at that time.

chant took orders on duplicating or triplicating books, kept the original in his register behind the clip spring which held all the slips of sales to one customer, and gave to the customer a duplicate or triplicate slip.

When a second charge purchase was made, the new amount was added to the previous total owing on the account and the total owing to date plainly set down. Thus, information as to the condition of the account was always obtainable. Such a system was indeed a great improvement over the old method of bookkeeping, which often led to disputes between the customer and the merchant, and more often to actual loss for the merchant when items were not recorded.

The early credit register, although fundamentally the same as the device of today, was, to a great extent, manufactured by hand. For instance, the leaves moved up and down on spring hinges which were wound by hand; the clip springs which held the sales slips in the compartment were produced

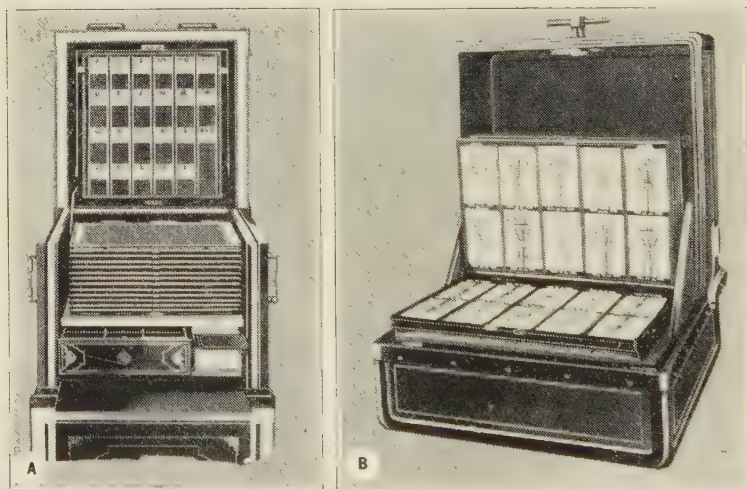


Figure 108: Two credit systems use metal-hinged leaf devices as pictured here. Illustration A shows how the index is carried in the top of the register. Illustration B shows how sales slips are filed in separate compartments. See pages 303 and 304 for full details.

by hand, and even the small, flat-bed presses were fed by hand. The first few years the manufacturers of the credit register encountered many difficulties in actual manufacture and marketing. However, the value of the machine to business was realized by many, and this made it possible to make several additions to the original credit unit, so that a complete shop-keeping system was evolved.

In the early days of the credit register there were numerous companies which attempted, without success, to put out devices built upon the early principle of filing one copy of the duplicating sales slip in the store and giving the other to the customer. Since then, however, several companies have been organized and are at present selling credit registers based upon the sales-slip filing principle.

THE PRESENT-DAY CREDIT REGISTER AND SYSTEMS

In carrying out the idea, the several companies which developed credit systems invented their own method of housing the records—hence their own filing systems—so that there are now two types of credit registers on the market. For convenience here these two types will be called the daily-account type and the daily- past-account type. It should be remembered, however, that the register is simply a means of carrying on a *system*.

*The Daily-Account Type.*¹ The daily-account credit register is a one-section file cabinet which is so arranged that the sales slips for each account may be filed in a separate, individual compartment. In each compartment are copies of all orders, the top slip showing the account to date.

The cabinet of the daily-account credit register is made in both wood and steel. The steel cabinets are generally constructed like a safe, having double walls between which there is a composition of fire-resisting substance. When

¹Manufactured by such companies as Add-Index Corporation; American Sales Book Company, Limited; Champion Register Company; Cosby-Werth Manifold Book Company; McCaskey Register Company; The Reliable Systems Company; and United Autographic Register Company.

closed, the cabinet is securely locked, and thus is theft-proof as well as fire-proof. The size and form of the cabinet¹ differ in practically every make, and in some cases the cabinets are equipped with additional drawers² for miscellaneous accounts, temporary accounts, or "over capacity" accounts.

One of the important features of the daily-account credit register is the compartment device which holds the sales slips. There are two different kinds of devices—one, the hinged leaf, and the other, the pocket receptacle. The hinged-leaf device is made up of several leaves, the capacity of the register depending upon the number of leaves. These leaves are composed of metal or flexible boarding. The entire leaf device is encased in the cabinet, so that each leaf swings from a horizontal to a vertical position. The metal leaves are divided into compartments, each compartment or receptacle being the size of an ordinary sales slip, so that sales slips from sales books or autographic registers can be accommodated. These slips are held in place by spring clips which equip each compartment. The first leaf is usually divided into smaller compartments arranged in vertical columns for the alphabetical indexing of accounts. Each of these small compartments provides for the insertion of index cards, and temporary or miscellaneous charges are kept therein, as well as the c.o.d. orders.

The flexible-leaf device is also made up of many leaves about the size of the ordinary sales slip and arranged with overlapping edges so that each leaf forms a filing device for individual accounts. Every leaf is hinged at the top and extended at the bottom by transparent index tabs under which index cards may be slipped. The lower edge of each leaf is cut away so that the total amount of each account is visible.

Figures 108, 109, and 110 illustrate registers of the daily-account type. Note that the registers in illustrations A and

¹A variation of the usual size and form is the "Secretary" described in detail in Chapter XIII.

²The credit register manufactured by such companies as The Champion Register Company provides a cash drawer with recorder of every transaction, which is a part of the regular equipment.

B of Figure 108 have metal-hinged leaves, while the register in Figure 109 has flexible-hinged leaves.

A second kind of compartment is the pocket receptacle. This device is a metal cabinet containing vertical columns of individual account pockets of sales-slip size. The pockets overlap, showing a name card or index card which is movable to make the cabinet self-indexing. When the cabinet is opened, the names of the entire list of credit accounts are shown, but the amounts owed are concealed from curious eyes.

The registers in illustrations A and B of Figure 110 have pocket receptacles. Note the book-like construction of the cabinet in illustration A and the upright construction of that in illustration B.

As the credit system developed, additional features ap-

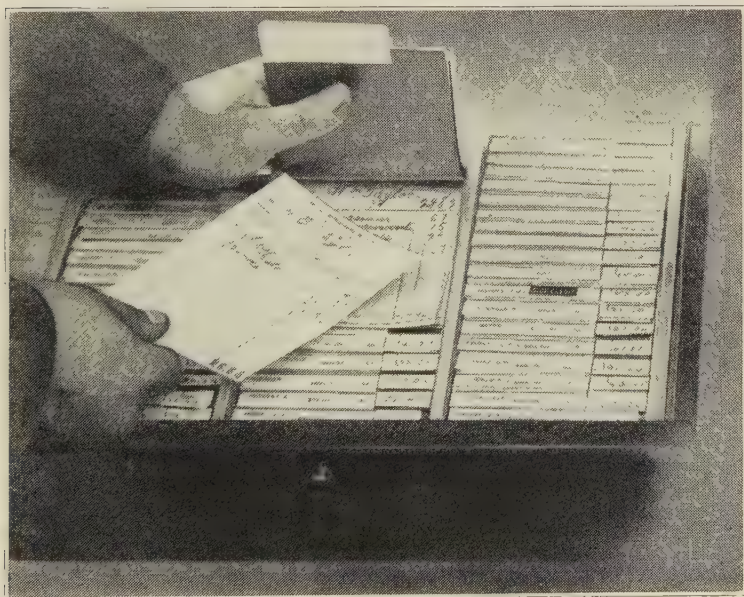


Figure 109: The flexible-leaf device offers a visible index which gives the name of customer, account number, and amount due. This picture also illustrates how slips may be kept filed to date. See page 304.

peared. With these systems summary records can be made each day, so that the proprietor always knows where he stands. Forms are furnished for this purpose as a part of the system. In one case, for instance, a book¹ is used to keep a complete record of daily totals. In another case there is a device² which is a part of the regular equipment, and which provides a record sheet, placed so that a description of the sales, distribution of sales, and so forth, may be jotted down at the time of the transaction. This record sheet is inserted so that the data are written in an aperture over which appears the column heading. (See Figure 108.)

One of the important considerations of the operation of the daily credit system is the index device. No matter what kind of credit register is used, the index should provide certain data for the merchant and his salespersons. These data should inform the salesperson as to the name, account number, charge to date, and charge limit. The alphabetical arrangement facilitates the locating of the account so that any credit customer's name may be found instantly.³ When a numerical index system is used in addition to the alphabetical system, each leaf is numbered at the top to correspond with the index.

Further data—as, for instance, the credit limit—should be listed also. The credit limit is usually decided upon by the customer and the merchant when the account is opened. Special cards may be used to be inserted in the account receptacle as a signal to the merchant and his salespersons that a customer's account has reached the credit limit. A second card may be used to indicate the date when a customer should pay or has promised to pay.

¹Such companies as American Sales Book Company, Limited, and The McCaskey Register Company include with the register installation a business recorder.

²A recording device as a part of the regular equipment is manufactured by such companies as The Champion Register Company.

³Some companies, such as The Champion Register Company and The McCaskey Register Company, manufacture a device which carries the leaf number in a clearly visible position and provides for instant finding and opening of the leaf desired.

The audited slips should be kept separate from the unaudited slips, so that when the merchant takes his total at night he can tell which are the accounts for that day and which are the audited slips. A wire clip may be used for the purpose of distinguishing between the audited and unaudited slips. When a name card is used, this is accomplished by filing the daily unaudited slip in front of the name card and when it is audited, behind the name card. The "o.k." stamp and the "audit card" also answer the same purpose.

When a customer makes a purchase, telling the salesperson to charge it, the salesperson locates that customer's account in the credit register by means of the index. He adds the amount of charge-to-date to the amount of sale, files the sales slip, and gives the duplicate to the customer. If the customer has reached the credit limit, the card denoting the condition of the account offers a means of reporting the con-



Figure 110: The credit registers shown here have very interesting features. Note the book-like construction of the credit register, illustration A; also note how the pocket receptacles in the credit register shown in illustration B are pulled out and held in position for filing sales slips. See page 305.

dition of the account to the customer. The entire transaction may be completed within a few minutes' time.

*The Daily- Past-Account Type.*¹ The credit register which is called the daily- past-account type is made in two sections: one, a daily-account section; and the other, a past-account section. The daily-account section provides for the filing of charge accounts each day; the past-account section provides for the filing of past accounts which have been transferred from the daily-account section.

The two-section filing device is encased in a metal cabinet of fire-resisting construction. Each section is composed of metal-hinged leaves which are equipped with individual account compartments. The sales slips are filed in these compartments or pockets which are constructed so that they expose to view the amount-half of the sales slip. At the top of each individual compartment there is a clip for the insertion of an index card which bears the customer's name, account number, and other important data. Figure 111 illustrates the daily- past-account credit register. Note the index system at the top of the leaves of both sections.

The daily section is open for filing, while the past-account section is enclosed by a glass top and guarded by a key lock. Each leaf in the past-account section is duplicated in the daily section in size and arrangement, and is so connected with the daily-section leaves that the operation of one leaf moves the duplicate in the past-account section. Between the two sections there is a compartment for filing c.o.d. slips. At the back of each section compartments are provided for filing miscellaneous accounts or temporary charges.

When a charge sale is made, the salesperson locates the individual account compartment in the daily section. As the leaf in the current file is moved, the corresponding leaf in the other section also moves, thus allowing the salesperson to see through the glass top of the past account the

¹Manufactured by such companies as The National Cash Register Company.

amount of the account to the last purchase. The amount is carried forward on the sales slip and the last sale amount added, giving the total balance of the amount due. The sales slip is then filed in the proper compartment of the daily section.

At the end of the day the merchant transfers the daily-account slip from the daily section to the past section. By this act he has personal control and knowledge of all credit accounts that have been active during the day. He is also provided with the opportunity of verifying the accuracy of the addition, of the amount brought forward, and of the prices charged for the goods that the customer bought. The daily section provides all information on the amount of credit sales during the day, while the permanent or past section shows the balance owing.

THE VALUE OF CREDIT REGISTER SYSTEMS TO BUSINESS

Perhaps the greatest service the credit register gives to the merchant is the authentic system of bookkeeping by a single operation. The credit register places at the merchant's fingertips accurate data and authentic reference. It not only eliminates the necessity of several writings of the accounts, and protects against the losses due to errors in recopying figures, but also offers an indisputable reference which is of the greatest value to both the merchant and the customer. The merchant can give any customer a detailed and instant record of his account.

This means that the department stores with 300 or 400 charge accounts must have an adequate means of keeping records of these accounts up to date. When a sales slip is sent to the office or cashier for authorization, the duplicate sales slip may be filed by the person in charge. If the credit limit has been reached, the card indicating this condition of account makes it possible to notify the customer.

Likewise, in one-department stores, as grocery stores, meat markets, hardware stores, and other retail shops, the credit register system is of inestimable value. For in stores of this kind, where all salespersons have authorizing power, the credit file must be highly systematized. When a charge sale is made, the salesperson must complete the transaction then and there by filing the credit sales slip. When several persons have access to the credit register, the system must be efficient.

Furthermore, the credit register provides a means of supervising the credit business with a minimum effort. It keeps the merchant informed as to the condition of his business by means of a daily audit which takes only a few minutes at the end of each day.

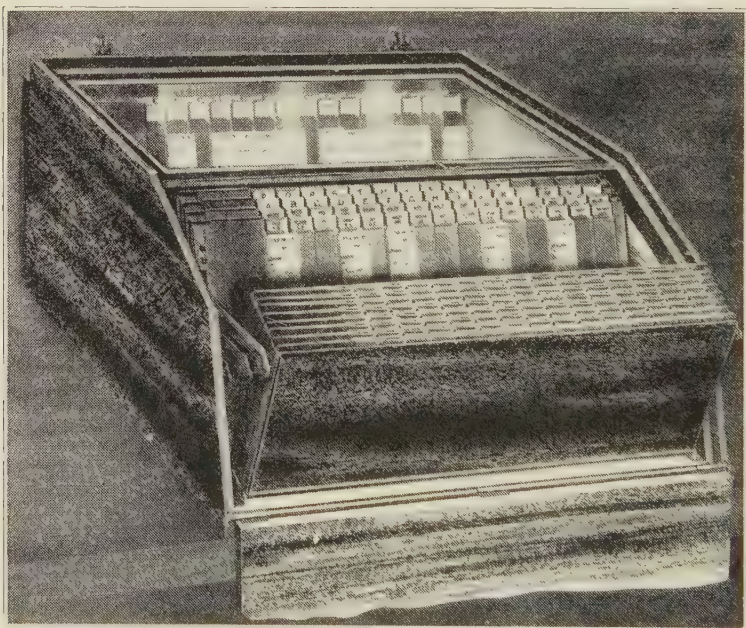


Figure III: The credit register here shown is composed of two compartments. By manipulating the leaves of the daily or front section, the amount due may be determined through the glass top of the locked section in the back. See page 308 for full description.

To sum it all up, the credit register gives an accurate bookkeeping system on charge accounts which requires that the entry be itemized only once, thus saving time; it keeps the merchant informed, hence it provides a means of supervision; it furnishes authentic proof, and so gives the customer confidence and promotes good-will between the customer and merchant.

XVIII

ADDING MACHINE-CASH REGISTERS

Accurate bookkeeping methods for the retail store. Recent creation of the adding machine-cash register. Chief characteristics of the adding machine-cash register: the adding unit; the cash drawer. Two types available: the single printer; the duplicate printer. How transactions are recorded. These registers make record-keeping simple.

It is evident that if retailers are to exercise the right kind of control over their businesses they must be provided with all the important details of the transactions incident to the day's business. If the departments which pay and those which do not are to be determined, records of all transactions by departments must be kept. In other words, experience has taught merchants that, to arrive at decisions based on facts, each department must be treated as a separate business or unit; daily records which will make it possible to ascertain what has been sold in each department, the character of the sale, the total of all sales, the total amount of all money paid out, and the sales made by each salesperson, and so forth, must be available. Furthermore, retail merchants should be able to ascertain assets and liabilities daily, weekly, monthly, and yearly, and should so keep records that income tax returns may be made easily.

Now, it is a well-known fact that a large number of retail stores have methods of bookkeeping or record-keeping that are far from being accurate, or that are too complicated, too slow to provide the needed information at the right time. Think of the benefits that those store owners would derive if they had in use a mechanical device, such as the adding machine-cash register, that would accurately, quickly, and completely register all important, necessary details of every day's transactions!

When an adding machine-cash register has been installed, a simplified system of bookkeeping, which the machine makes possible, is all that is required to enable the proprietor or an employee to make the necessary records pertaining not only to the day's transactions, but also to the accumulated transactions of the week, month, or year to date. The adding unit,¹ which may be disengaged at will from the cash drawer, can be converted into a separate adding machine with the usual advantages, so that at the end of the day the merchant, by its use, can obtain such specific facts as he may desire by rapid recapitulation of details. Cash sales, charge sales, paid-out items, and received-on-account items may be totaled separately. Department totals and totals by individual salespersons are also obtainable in the same way, thereby affording a complete check by departments as well as by salespersons. The detail strip for the day may be filed as a permanent record or used in entering the totals in a day-book or ledger, thus enabling the owner, or supervisor, at the close of the day, to balance the records and compile a statement even without actual bookkeeping knowledge.

RECENT CREATION OF THE ADDING MACHINE-CASH REGISTER

The adding machine-cash register is a relatively recent creation. It has only been a few years since the manufacture and marketing of this register came about. Although the need for such an adding machine-cash register combination had been felt for many years, it was not until about 1919 that several adding machine manufacturers began experimenting with combinations of their particular makes of adding machines and cash drawers. Later these machines were equipped with mechanical operating devices which combined the two units into the present efficient adding machine-cash register. This combined machine

¹If the reader is to have a thorough understanding of this chapter, it is essential that he refer to the chapter on Adding Machines.



Figure 112: The old way and the new! No more pencil figuring on a paper bag or any loose piece of paper. The problem of listing and computing is made easy and greatly expedited when an adding machine-cash register is used. This means a saving in time and money for the merchant, as well as an increase in confidence and good-will among customers.

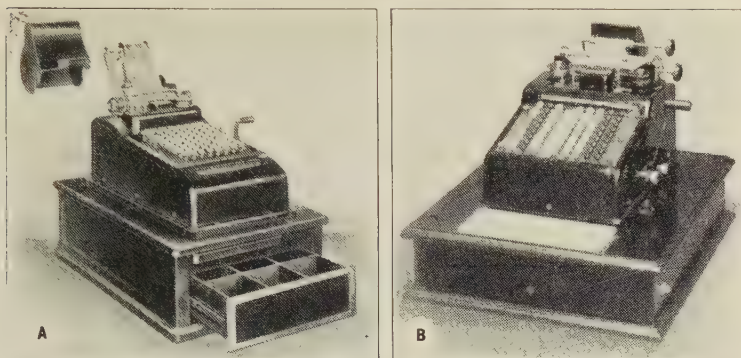


Figure 113: An itemized record of each sale, character of transaction, and total of all transactions made by each salesperson may be recorded by using an adding machine-cash register. In fact, any retail store using such a machine may realize how accuracy builds good-will. Read the description of this type of machine beginning on page 317.

has developed into a mechanism with such varied and wide uses that it is being adopted by thousands of different kinds of businesses.

CHIEF CHARACTERISTICS OF THE ADDING MACHINE-CASH REGISTER

The register which combines the adding and listing machine with the cash drawer has two necessary characteristics—first, the adding unit with its facility for printing a permanent record of the details of a transaction; second, the cash drawer with safety devices, making it necessary to make a complete record of each transaction.

*The Adding Unit.*¹ The adding unit is generally the listing type and is usually detachable. For the adaptation of the adding machine to the cash register, extensive changes were necessary in order to provide for printing details of every transaction.

¹Such companies as the Indiana Cash Drawer Company manufacture cash drawers which are especially built for certain types of adding machines.

Special operating keys are set apart on most machines of the full-keyboard type for printing such data as the salesperson's number, the department number, the kind of sales—whether “cash” or “charge”—and all other information necessary for the proper classification or analysis of transactions. Most types of machines are equipped with locks and other safety devices which prevent tampering with cash or records.

On the roll of paper which is carried by the adding unit or on special distribution sheets which certain of the machines provide, are printed the amount of each sale, the department classification of each item, the total amount of the transaction, and the salesperson's initials or number. Details of a transaction may be given to the customer, in which instance a duplicate of such details is automatically rewound and retained in the machine.

*The Cash Drawer.*¹ Cash-drawer cabinets are made of both wood and metal, finished in mahogany or oak, and arranged into compartments for coins and bills. A release mechanism automatically opens the drawer when the adding machine is operated in connection with recording a transaction. When the adding machine is used for adding or figuring, the cash-drawer mechanism does not function except when controlled by set-up levers.

TWO TYPES AVAILABLE

As the adding unit and the cash drawer were united into one machine, various means of combining the two developed. Adding machine-cash registers may be classified into groups according to the manner in which they function. There are two distinct ways in which the adding machine records the transactions made in conjunction with the cash drawer. According to this classification there are two types

¹Such companies as the Indiana Cash Drawer Company manufacture cash drawers of this type.

of adding machine-cash registers: single printers and duplicate printers.

*The Single Printer.*¹ The adding unit of the adding machine-cash register which is equipped with a single detail strip is here called the single printer. This type of machine accumulates the totals of each transaction, but lists the individual items of each transaction without accumulating them. As the adding unit prints the items, the amounts are accumulated in the total dials of the machine. The registers may have one or two sets of adding counters. When there are two sets of adding counters, one counter accumulates the total of the individual transactions while the other registers the grand total of all transactions.

When a single-printer type is used, the detail strip may either be issued as a receipt or rewound within the machine as a permanent record. When the detail strip is issued to the customer, it offers a check and assures the customer that the correct amount has been registered. At the end of the day the total amount of transactions is shown in the counter of the machine. When the detail strip is rewound in the machine, it offers a complete and detailed record of all transactions throughout the day. The total of the amount printed on the detail strip offers a check with the grand total shown in the counters. Figure 113 shows two adding machine-cash registers of this type.

*The Duplicate Printer.*² The adding unit of the adding machine-cash register which is provided with two detail strips, each wound on separate spools, is here called the duplicate printer. As the items are printed on one strip automatically they are also duplicated on the second detail

¹The single-printer type of adding machine-cash register is manufactured by such companies as Add-Index Corporation; The Dalton Adding Machine Company; The McCaskey Register Company; Sundstrand Adding Machine Company; and Wales Adding Machine Company.

²The duplicate-printer type of adding machine-cash register is manufactured by such companies as Add-Index Corporation; The Dalton Adding Machine Company; The McCaskey Register Company; Sundstrand Adding Machine Company; and Wales Adding Machine Company.

strip. One strip is then given to the customer as a receipt, while the duplicate is rewound within the machine as a permanent record. Figures 114 and 115 show two of the numerous makes of duplicate printing registers. Note the detail strips or rolls.

HOW TRANSACTIONS ARE RECORDED

All types of adding machine-cash registers are operated in much the same manner. The amount of sale is registered by depressing the corresponding keys of the adding machine and operating the handle or lever which causes the machine to print the items and open the cash drawer.

In order to understand more completely the time- and money-saving system which this combination register makes possible let us trace briefly certain of the transactions of a day in a store where adding machine-cash registers have been installed.

Salesperson A in Department 3 sells merchandise to the value of \$4.50. In recording the sale he depresses, first, the department key 3, second, the A key representing his initial, and third, the keys which set up four dollars and fifty cents on the keyboard. By operating the handle or lever the amount of the sale, the department number, the clerk's initial, and a symbol denoting a cash sale are registered on the detail strip or strips. The amount is also accumulated in the total dials and at the same time the cash drawer is automatically opened.

When a charge sale is to be registered, a "charge" key is depressed which prevents the amount of the charge sale which is recorded on the strip from being added into the totals. In like manner, a record of an amount received-on-account is registered. However, in this instance the "received-on-account" key is depressed before the lever is operated, thus causing the item to be properly designated and at the same time adding the amount in the total.

If money is paid out, a record of such payment is made

by depressing the proper amount keys, the salesman key, and the "paid-out" key, whereupon the amount paid out and by whom paid is printed on the detail strip, but the amount representing this paid-out item is not accumulated in the total. It may be automatically subtracted from the total, provided the adding unit is equipped with direct subtraction.

THESE REGISTERS MAKE RECORD-KEEPING SIMPLE

It has already been shown that the adding machine-cash register provides the retail merchant with an efficient and simple system of record-keeping and at the same time affords facilities for highly organized supervision. Furthermore, the accuracy and speed of the machine renders its service of great value to the customer as well as to the operator.

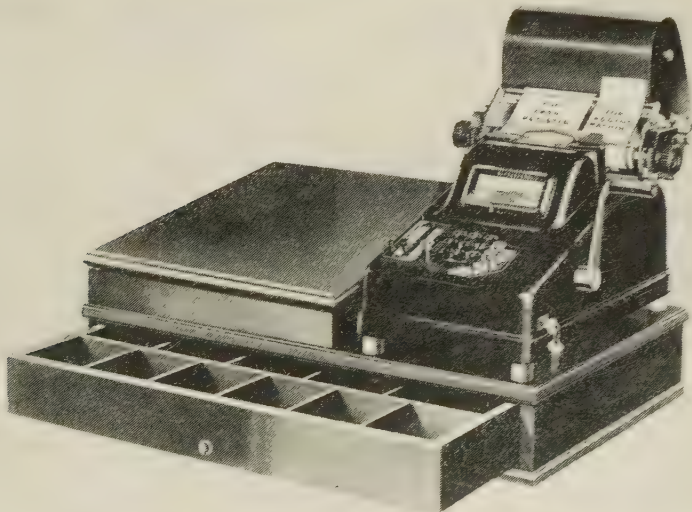


Figure 114: The duplicate adding machine-cash register above makes two separate records as is indicated on the detail strips. Note how the strip for the cash register is rewound within the machine, while the adding machine strip is issued to be given to the customer.

The bookkeeping system which the adding machine-cash register affords has been discussed in more detail in the previous pages; however, a brief summary will be given here. The adding machine-cash register issues an itemized receipt for the customer, retains a copy for the merchant, and provides facilities for the efficient and proper handling of cash. By means of the detachable adding unit and the detail strip it supplies all necessary details of daily, weekly, monthly, and yearly transactions.

Thus it provides the merchant with information which enables him to supervise the selling, buying, and the sales force by department and by salesperson. He may also find the adding unit useful for checking previous records and setting quotas for departments and salespeople. The printed

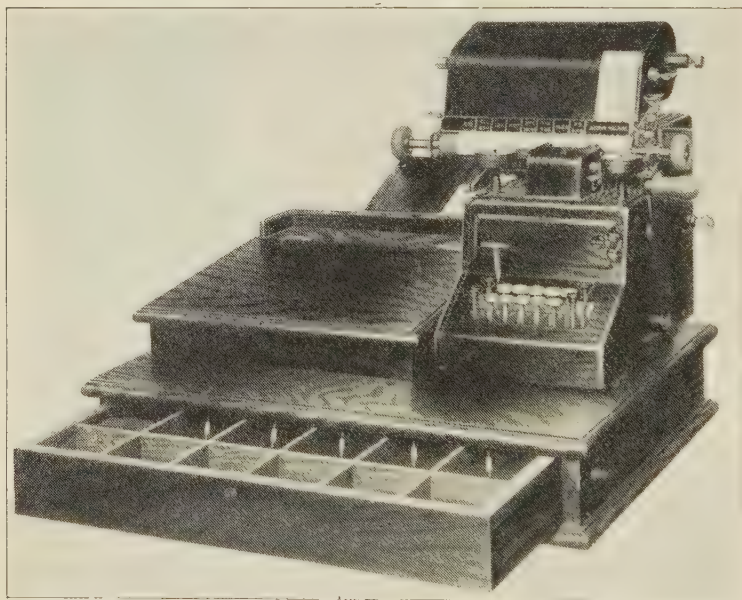


Figure 115: Of great value is a device which makes it possible to record duplicate copies—listing items on one copy and cross-tabulating by departments on the other. Note the two separate records which this machine makes. See page 318.

records serve to check the activities of salesmen and fix responsibilities. At the same time the printed receipt which the machine issues to the customers is of great value to both customer and merchant in that it places all transactions on a strict business basis, thereby preventing argument and misunderstandings.

XIX

ADDING MACHINE-CASH AND CREDIT REGISTERS

Advantages of handling cash and credit transactions in the same register. Two types of registers available. The combined unit type. The automatic combined unit type: the credit file selector; the individual credit tray selector. The combined register solves bookkeeping problems.

THE numerous advantages of the adding machine-cash register,¹ which has just been described, and the credit register,² also previously described, brought to the merchants the realization of the merits of a single register uniting all of the features of three devices: the adding machine-cash and credit registers. Each of the units of this complete system has its own distinct advantages; therefore, the advantages of the combined register are threefold: It offers an efficient manner of taking care of cash, an accurate book-keeping system on accounts receivable, and a positive method of handling credit accounts. Moreover, the fact of handling both cash and credit sales in the same register offers a high degree of efficiency. The combined cabinet provides a saving of counter space and a saving of the time and effort required in operating two separate units.

For years the need for one complete system which would register sales and departmental business, cash and credit, and at the same time secure the total of business with mechanical speed and accuracy, had been recognized. It was not, however, until the recent depression period of business that the merchant fully realized the need of an efficient means of

¹The adding machine-cash register is described in detail in Chapter XVIII; therefore, only the combination of these features with the credit register will be discussed here.

²A complete description of credit registers is given in Chapter XVII.

controlling his business, cutting down his expenses, and maintaining his balance against failure and bankruptcy. The manufacturers rose to meet the merchant's realized need and the result was a combined register which took the adding machine, the cash drawer, and the credit files as its basic units and added uniting features.

TYPES AVAILABLE

There are now two classes of adding machine-cash and credit registers, which may be called, for the purpose of this book, the combined unit type and the automatic combined unit type. The combined unit type provides a mechanism for operating the cash drawer in conjunction with the adding machine and a credit file which is accessible at all times and, therefore, not operated mechanically. The automatic single unit type provides a mechanism which operates the credit unit as well as the cash drawer. Each unit may be operated separately, at will, and in conjunction with the adding machine.

THE COMBINED UNIT TYPE¹

The combined unit type is composed of an adding machine-cash drawer register with a credit register so combined that the individual accounts are visible at all times. The adding unit of this register is of the adding and listing variety and equipped with special keys to denote the department, salesperson, and character of the transaction. The credit unit is made up of compartments where individual accounts can be filed in a manner which gives the account to date. An index arrangement offers a convenient means of reference to any account, and thus any information may be quickly obtained. For convenience the credit unit is located at the

¹The combined unit type is manufactured by such companies as Add-Index Corporation; The McCaskey Register Company; Sundstrand Adding Machine Company.

left of the adding unit and above the cash drawer. The drawer cabinet may contain one or more drawers; the arrangement usually provides for one large cash drawer and one or two small drawers, to be used for special or miscellaneous matter, or as a supplement to the cash and credit units.

Figure 116 shows two of the combined unit adding machine-cash and credit registers. Note the position of the credit file to the adding machine and cash drawer. Also note that the cabinet of register A has two drawers directly beneath the credit file, while the cabinet of register B has one large cash drawer.

When a sale is made, the salesperson registers it according to type of transaction, amount, department, and salesperson by depressing the keys of the adding machine indicating these facts. As the adding unit is operated, the cash drawer is opened if a cash or received-on-account sale has been made. However, if a credit sale has been registered, the cash drawer remains closed. The salesperson then files the sales slips in the proper compartment of the credit file. The detail strip rewinds itself within the machine, thus offering a means of exact check-up.

THE AUTOMATIC COMBINED UNIT TYPE¹

The register which provides a mechanical device that brings the credit file automatically into operating position is here called the automatic combined unit type. There are two kinds of registers of this type—one which brings the entire credit file into the operating position; the other which performs a selective operation. The illustrations in Figures 117 and 118 show each of these very different kinds of automatic combined units.

The Credit File Selector. When the entire credit file is operated, the register is built so that the cash and the credit

¹The automatic combined unit is manufactured by such companies as Add-Index Corporation and International Accounting Machine Company.

unit may be placed in a two-drawer cabinet. The credit file contains separate compartments for each individual account; and each compartment is so indexed that the customer's name, account number, total amount of charge to date, and credit limit are visible at all times.

The adding unit, which is combined to form the automatic combined unit type, has special features for operating the cash and credit units. It is so equipped that when a cash or paid-out transaction takes place, the operating mechanism opens the cash drawer, and when a credit or received-on-account transaction, the credit drawer opens, while the cash drawer remains closed.

Figure 117 shows an automatic combined unit which is designed with additional features in order to fulfil further requirements. Note from the illustration that there are five drawers built in this cabinet; one is for cash, and another for credit accounts. A third drawer may be used as a utility drawer for special purposes or equipped to supplement the cash or credit drawers. For doctors, dentists, or architects this drawer affords a suitable place for the instruments of their professions, and for this purpose it may be lined with velvet. A hinged cover on the fourth drawer provides a writing surface, at the back of which is a counter-

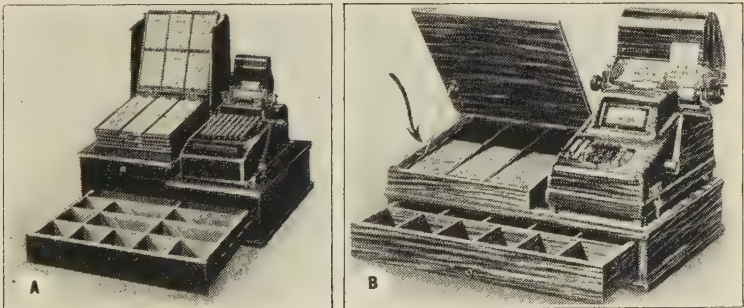


Figure 116: The machines shown here offer an accurate bookkeeping system, an efficient handling of cash, and a positive record of credit accounts. Other interesting accomplishments are described in this chapter. See page 324.



Figure 117: Additional features, combined with this adding machine—cash and credit register, offer a key lock safe compartment for valuable merchandise and an extra drawer which may be equipped to supplement the cash or credit drawers, or for special purposes, such as for doctors', dentists', and architects' instruments. See page 325.

sunk pencil tray and ink-well. Beneath the cover is space for correspondence and stationery.

At the upper left-hand corner of the lower section is a safe compartment equipped with lock and key, and directly beneath it is a small drawer, also provided with a key lock. Books and valuable merchandise may be kept in the large open compartment of the lower section. A flexible steel curtain covers the entire cabinet or may be dropped to the second or middle position concealing the lower compartment, which is accessible only to the proprietor or any other person who knows the combination.

The Individual Credit Tray Selector. One style of combination adding machine, cash register, and credit register

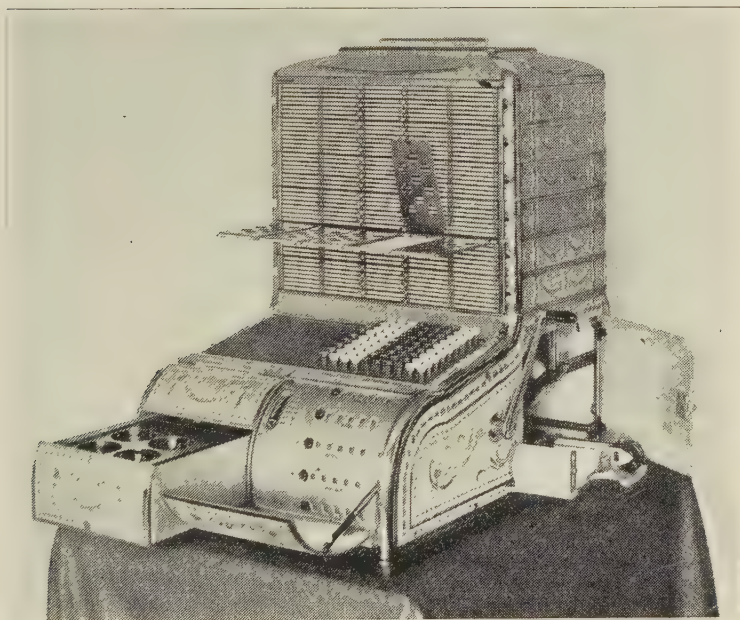


Figure 118: With the register shown here an individual account may be selected and automatically set forward in a position which facilitates the filing of the credit slips. Note how the credit tray is extended. Also note the adding counter dials which may be hidden from view by means of the shield. See this page and page 328 for further details.

offers a method of selecting individual credit accounts. The adding unit affords the means of selection. It is constructed with a keyboard which is arranged with one set of numerical keys for choosing individual accounts by number, another set of keys for straight addition, and a third set of symbol keys for identifying the symbol transactions. These total counters are concealed by a shield which may be unlocked by the proprietor when taking accounts at the end of the day.

This machine does not issue a receipt to customers, but the detail strip is rewound within the machine. On the strip are printed the date, the amount of the sale, a complete detail of charge sale, that is, customer's account number, amount, and salesperson; a complete detail of cash sale, received-on-account transactions, amount of money paid out and by whom; bank deposits, which are listed and added; and a complete detail of invoice. Cash sales, charge sales, paid-outs, received-on-account, and invoices are added separately and the total of each printed.

Built within the same cabinet, the cash drawer is placed to the left of the adding unit, while the credit file is above the adding machine. The credit file consists of horizontally filed trays of 40 accounts each, with a separate compartment for each customer. Additional files also of 40 accounts each can be added at any time so that a capacity of 1,000 accounts can be obtained. The compartments are about the size of a sales-book slip and are equipped with individual covers which hold the slips in place and also act as a blind when the tray is open (see Figure 118).

As the amount of sale is set up on the adding unit, the keys denoting the type of sale are depressed. If a credit sale is made, the credit key is depressed, then the individual account number; as the adding unit is operated automatically the individual account tray is set forward in such a position that the sales slip containing the detail of the sale may be filed. If a cash sale is made, the operating crank locks the credit trays, opens the cash drawer, sets the

amount on the register, and totals and prints a permanent record on the detail strip.

THE COMBINED REGISTER SOLVES BOOKKEEPING PROBLEMS

Wherever cash and credit business is carried on, there an adding machine—cash and credit register may be used. Consider for a moment the number of retail stores operating on a cash and credit basis. Literally hundreds of thousands of retail stores do cash and credit business. The acceptance of the combined register in stores of this type is due to the great service which it renders. The fact that a complete method of bookkeeping, covering credit as well as cash transactions, is offered by one register, is, no doubt, the reason why the adding machine—cash and credit register is so generally coming into use.

It is by no means a small problem that bookkeeping presents to the merchant. A machine which mechanically solves these record-keeping problems offers the merchant a service of high degree. As the daily routine of the business goes on, the register acts as a constant recorder. Each detail of every transaction is recorded in a way which makes possible a method of compiling permanent records, and hence, enables the merchant to manage his business intelligently. Free from energy-consuming detail work, yet fully informed of all details of his business, the merchant is given the opportunity of visualizing and planning a greater development of his business.

XX

DICTATING MACHINES

The need for the dictating machine. The early history of the dictating machine. Three units of the dictating machine system: the dictating machine; the transcribing machine; the shaving machine. Creating a dictating machine system: the transcribing department; cylinder shaving section; the dictator's system; time and record keeping. The uses and advantages of the dictating machine.

EXECUTIVES fully appreciate the fact that the written document plays an important rôle in business, that it reflects the character of the firm's management and, as a result, affects the reputation of the house—either favorably or unfavorably. Consequently, no effort is spared by the modern business man to insure the production of the written word in such quantities as are needed, and in such time as is available, in order to establish proper records and provide the right kind of correspondence with other business houses or individuals.

To achieve such results, shorthand was, and still is, a great help, but with the growth of large-scale business during the latter part of the nineteenth century, it became obvious that some device was needed that would do away with the frequent obstructions incident to the delays and inconveniences of the shorthand method.

The inevitable outcome of this growing need for speed and simplification in correspondence work and the making of business records was the dictating machine, a device which is available regardless of time or place, as it eliminates the need of a second party to take down the dictation.

The growth of the dictating machine as an office appliance has been very steady, and today there are thousands in daily use in every kind of office. In fact, it has been stated that dictating machines are to be found in every kind of business

and profession, performing every type of work where the human voice is a factor.

THE EARLY HISTORY OF THE DICTATING MACHINE

To trace the actual beginning of that romantic story of transcribing, it is interesting to note that thousands of years before the typewriter made such an epochal change in letter writing, various shorthand methods had been devised whereby a man could dictate to a clerk, who did the actual writing. It is believed by some that Xenophon took down Socrates' lectures in shorthand; and it is an established fact that Tullius Tiro, Cicero's secretary, devised a system which came into general use. The 5,000 signs which he used for words would play havoc with modern patience, but to the ancients it seemed a great improvement, and many mastered the new art.

The sermons of Chrysostom, St. Augustine, and others of the Church fathers were noted in shorthand; in later centuries it was used by Savonarola, Roger Williams, Pepys, and Charles Dickens—not to mention the multitude of others.

It seems almost prophetic that shorthand should have been perfected on the eve of the invention of the typewriter. Without this machine, shorthand, even as perfected by phonography, would have but partially freed the executive from the bondage of the pen. The typewriter emancipated him entirely from actual writing. After this pioneer in modern office appliances had paved the way, came a logical development—the dictating machine.

The invention of the phonograph in 1877 by Thomas A. Edison introduced a principle which had a great influence upon the invention and development of the dictating machine and later the musical phonograph and graphophones. In 1887 the dictating machine was first introduced to public notice, and became known as the "Graphophone." It was a joint invention of Mr. Chichester A. Bell and Mr. Charles Sumner Tainter. This machine recorded

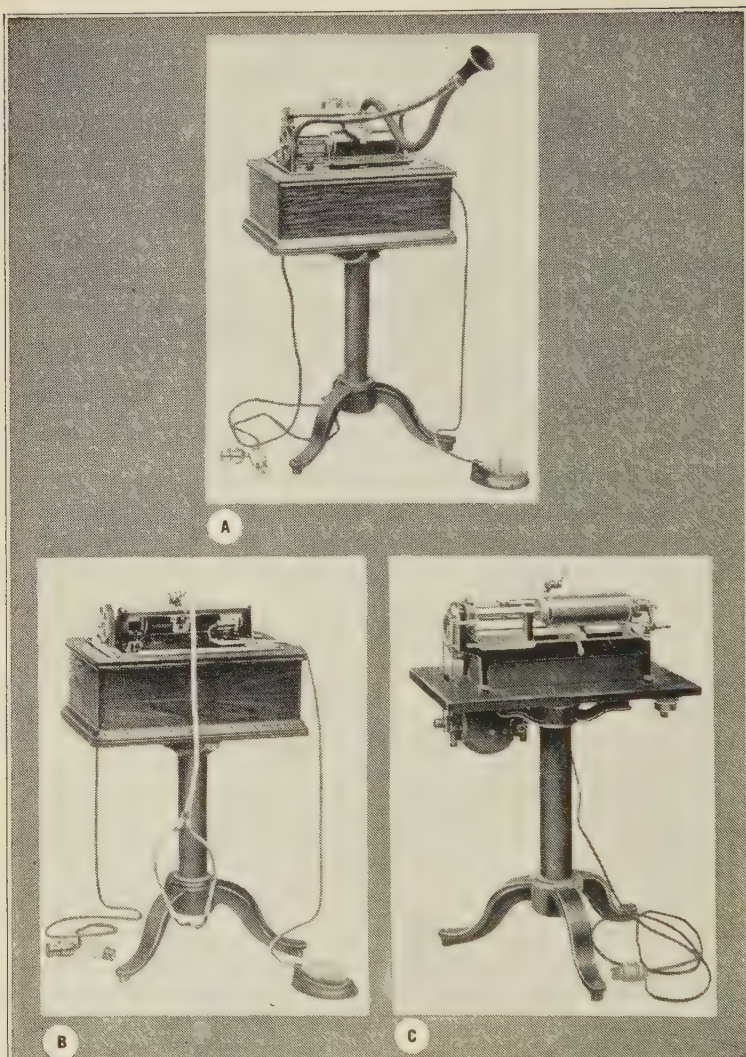


Figure 119: One of the earlier dictating machine systems used a foot-bulb control for the dictating machine (illustration A) and for the transcribing machine (illustration B). The shaving machine is shown in illustration C. Contrast this system with the modern machines pictured in Figures 120, 121, and 122. See pages 333, 335, 336, 339, 341, and 343.

sound by a process of engraving a continuous spiral groove on a wax cylinder. The invention provided a means for permanently recording and indefinitely reproducing sound.

The practical application of the dictating machine was quickly appreciated by those to whom such an instrument would appeal, chief among whom were the official reporters of debates in the United States Senate and House of Representatives, and the principal court reporters at Washington, where the invention had its birth.

Experimental tests were given by the most expert stenographers in the world—the official reporters of the United States Senate and House of Representatives. These men put the invention to a very severe test, using it to receive dictation of their shorthand notes, then having the transcription



Figure 120: A dictating machine of the modern system is so simplified that its operation becomes purely mechanical. As an accurate and impersonal agent, the dictating machine records every word the dictator utters, and allows for the freedom of creative thought. See page 335.

made by typists who listened to the reproduction from the cylinders and typed what they heard. The introduction of the machine into the work of the reporters of the Senate and House was one of its earliest adaptations. From this application the use of the graphophone spread throughout the country.

The early graphophone had somewhat the appearance of a sewing machine, its power being supplied by a treadle motor and fly-wheel. The cylinder on which the sound was recorded consisted of a paper base with a thin coating of wax composition, on which the record was engraved by means of a steel needle. Mounted on a diaphragm, this needle sped across the machine where the cylinder revolved, and it engraved a spiral groove on the surface of the cylinder.

Improvements were brought out from time to time, simplifying and perfecting the mechanism and operation of the machine. But the underlying principle has always remained the same, and to this day successful talking machines of whatever name or plan operate on the engraving principle. (See Figure 119.)

The substitution of electric motors for clockwork, the gradual development of the quality of the cylinders, and the simplification of the whole mechanism of the graphophone have been decided steps in the progress of the business of talking machines. Today the use of the electric-motor-driven dictating machine requires little more effort than the use of the telephone.

THREE UNITS OF THE DICTATING MACHINE SYSTEM

The dictating machine system of transcribing is composed of three machines—dictating, transcribing, and shaving.¹ Each of these machines has its own distinct purpose: the dictating for the use of the dictator; the transcribing for the

¹Each of these machines is manufactured by such companies as Dictaphone Sales Corporation and Ediphone Division, Thomas A. Edison, Incorporated.

use of the typist, and the shaving machine to renew the surface of the cylinders.

The Dictating Machine: By means of the dictating machine the voice is recorded on a wax cylinder placed upon a flexible mandrel, or cylindrical spindle, which is rotated by a small electric motor. The vibrations of the dictator's voice are recorded on the cylinder by the process of engraving on the wax surface. Figures 120 and 121 show the dictating machines. Note how the mandrel is placed upon the encased motor. Also note the tube, the glass mouthpiece, and the recording device which moves across the cylinder.

The machine is small and occupies little space, so that it may be placed on the dictator's desk or on a stand at the side of his desk. When using the dictating machine the operator raises the tube, places the mouthpiece close to his lips, and, pressing the control device, speaks in a natural tone of voice just as though speaking into a telephone. As he pauses in his dictation for further thought, he releases the control, which is placed so that it may be easily operated.



Figure 121: The dictating machine may be placed on a stand at the side of the operator (as in Figure 120) or it may be placed on the desk as is demonstrated here. Note the position of the cylinder and also compare with Figure 120. A detailed description of the dictating machine is given on this page.

If the dictator is interrupted, or if for other reasons he wishes to have repeated what he has just dictated, he may listen to his own words by throwing a lever from the dictating position to the reproducing position.

The Transcribing Machine: Although similar to the dictating machine in appearance and identical in fundamental construction, the transcribing machine is entirely different in function—it reproduces word for word what has been dictated upon a cylinder.

Note from Figures 122 and 123 that the transcribing machine resembles in form and size the dictating machine. The



Figure 122: The transcribing machine faithfully reproduces the dictator's words and never tires of repeating. The transcribing machine and the typewriter work in perfect unison, so that transcription is simplified. See above for full details.

mandrel, the reproducing device, and the tube are in the same positions. Also note the receivers which carry the dictation to the typist. Beginning the operation of the machine the typist places the receivers on her ears, touches the control device, and listens to a number of words. She has complete control of the machine and may cut off the dictation while typewriting the words she has heard. Any word or phrase that the operator does not catch the first time may be repeated as often as necessary.

The Shaving Machine: This machine operates upon the same principle as a lathe which is used for shaving articles. The object is mounted on the lathe machine and rotated, while a tool thrust against it shapes it down, usually to some circular form. In the case of the shaving machine a cylinder is placed upon the mandrel and the knife adjusted to shave off the engraved surface.

Figures 124 and 125 illustrate shaving machines. Note that the cylinder is placed on the mandrel just as it is on the dictating and transcribing machines. The office boy, or any other person who takes care of this work, places the cylinder, adjusts the knife, and presses the electric starter. As the knife moves along the cylinder, it shaves off a very fine layer of the wax, thereby making the surface of the cylinder perfectly smooth so that it can be used again for dictation. Each cylinder may be used over and over again—often as many as one hundred times.

CREATING A DICTATING MACHINE SYSTEM

Small organizations that install dictating machines need not alter the regular office routine already worked out. In organizations where only one, two, or three persons dictate, the typist herself can take charge of the entire dictating machine system; that is, she can deliver, collect, and shave the cylinders. However, when an office boy is employed, the delivery, collection, and shaving of the cylinders can be

come a part of his duties. If any records are kept of the number of cylinders dictated, and so forth, these figures may be kept by the office manager or other executive.

In a large organization, however, a dictating machine installation requires a careful study of the internal conditions of every department and the building of a strong, systematic plan to fit the company. Large business organizations have either a secretarial system and a centralized system, or a central transcribing bureau. The most economical method of conducting office correspondence is to have a combination of secretarial system and centralized transcribing bureau, or a single centralized bureau where all correspondence is handled.

The Transcribing Department: The installation of a centralized transcribing department is not difficult. After determining the approximate number of operators needed in each department, and balancing this against the production of an average dictating machine operator, the groundwork is laid. Figuring that the average dictating machine operator writes a minimum of lines ranging from 1,000 to 1,400 per day and that the average letter consists of about 12 lines, the capacity of a single operator can be determined. Then, it only remains to determine the total number of letters which must be produced daily. This figure, divided by the average daily production of an operator, will give the number of operators required.

The room used for the centralized transcribing department should be light, airy, and free from disturbing noises. The dictating machines should be arranged on pedestals in rows with good aisle space, insuring that no operator has to disturb another in getting up from her desk.

Cylinder Shaving Section: The rack built to hold cylinders "to be shaved" and "shaved" must adjoin the shaving machines and be within reach. In planning these features care should be taken that the finished work is placed nowhere near the incoming work, or confusion will result.

The collection, distribution, and shaving of the cylinders are important features in the centralized transcribing departments. Some concerns use one boy for shaving and delivering blank cylinders, such deliveries being made twice a day—early in the morning and after lunch. Whatever the



Figure 123: Here is another style of transcribing machine. Although it appears to the average person to be similar to the one shown in Figure 122, there are mechanical differences. Note that the control is operated by hand pressure in Figure 122, and by foot pressure in Figure 123.

schedule may be, the trips must be planned at regular intervals determined by the size and the needs of the company.

The Dictator's System: With the department arranged and the collection and delivery system completed, the dictators should be carefully taught to use their machines properly. They should also be instructed to carry out the details necessary to the system—to mark the cylinder number on the dictating machine slip, and to write the name, the department, and the date clearly on the correspondence folder and slip.

Time and Record Keeping: A capable supervisor should be put in charge of the transcribing department to receive the work, to get it out, and to keep records. The record on the back slips, which accompany every cylinder, is of great value, especially to large organizations. It shows how long the service takes. It proves that the cylinders are written in order received. It shows up the poor dictator, the weak operators, and any errors in service. It fortifies the case of complaint in service from a dictator and checks up every operation of the system. The means of utilizing the dictating machine slip as a basis for determining the production of the operator is by far the quickest and safest.

Keeping entry records and entering the number of cylinders received from each department and from each man in the department and applying it against the number written per day shows where correspondence fluctuates. It proves either that more operators are needed, or that a retrenchment can be made, and on just what department's work the cut can be accomplished. It provides the details in regard to heaviness of work in the various departments and gives the information upon which to segregate the transcribing operators to various departments' work.

A centralized bureau plus a secretarial system for executives allows prompt and efficient handling of all regular mail, but it also is flexible, so that in cases of rush periods the cylinders of the chief executives can be passed on by their

secretaries to the centralized bureau for transcription. This makes the secretarial work easier and allows additional work to be taken on during rush periods, thus avoiding the congestion which is incident to the operation of a secretarial system without an outlet such as the centralized bureau provides.

The secretarial system should be planned along the same



Figure 124: Cylinders may be used again and again by means of the shaving machine. The cylinder to be shaved is placed on the mandrel and the knife adjusted. As the mandrel rotates, the knife shaves off the surface of the cylinder. See page 337.

lines as the centralized transcribing system. It is often necessary to plan the delivery system to take care of the distribution and correspondence from one executive to another and the work should be fitted into collection and distribution schedule so that the whole plan will operate efficiently.

THE USES AND ADVANTAGES OF THE DICTATING MACHINE

Dictating machines are found in use in business enterprises covering every known line of work. For instance, they are used by the leaders in such businesses and professions as:

Manufacturers	Railroads
Retailers	Real estate offices
Wholesalers	Public service offices
Associations: lodges and unions	Educational institutions
Doctors	Commercial schools
Lawyers	Mail-order houses
Hotels, hospitals	Architects
Banks	Financial institutions
Insurance offices	Publishers and printers
	Government offices

The use of the dictating machine is not confined to office work or routine correspondence. Whenever a record of any kind can be orally prepared, then a dictating machine can be used. It is used by the lawyer studying cases, or preparing data that require frequent reference to quotation. For the doctor in general practice, with his irregular hours, the dictating machine is available day or night, at hours when the services of a secretary cannot be expected. Surgeons make use of it in following cases during operations and subsequent observations; the minister finds the dictating machine ready to record immediately notes and memorandums, and frequently uses it for practice in developing his addresses, as do other public speakers. The dictating machine is also used in colleges for teaching languages; by musicians for training the voice; in schools for the teaching of shorthand and

typewriting; in fact, it can be put to any use, wherever the recording of a human voice is possible.

Not only the business organization but the individual dictator and transcriber are benefited from the use of this modern substitute for the stenographer. The convenience with which the individual can cut down work, saving precious hours which may be devoted to constructive planning, makes



Figure 125: The shaving of cylinders is a very simple process and is really an important part of the dictating machine system. The office boy can deliver, collect, and shave the cylinders at regular intervals during the day. See page 337.

the dictating machine invaluable to the executive. By simply lifting a receiver from a hook and speaking in a natural tone of voice, a long, studied letter, a terse note, a sales bulletin, or a speech may be recorded. That, it must be admitted, is no small saving of time.

It cannot be denied that the automatic catching of thought from the tip of the tongue contributes to better, more effective expression. Inspirational thinking has been developed by users of dictating machines because ideas can be recorded before they slip away. Enunciation, an important factor, is improved and perfected by using the device. Closer concentration is made possible. The dictator is guaranteed certain privacy of thought with the machine acting as a sort of silent, untiring stenographer with no human failing or variableness with which to reckon. Moreover, there is an absence of the human-factor element which often intrudes itself between dictator and stenographer, and by reason of a peculiar sensitiveness on the part of the dictator prevents the best expression of his thought. The dictator is alone with the person to whom he is talking, just as he is on the telephone, and the letter becomes a person-to-person talk. He puts his every-day self into this communication. Many men who formerly dictated stilted, stereotyped letters, relying on their secretaries to fill in the gaps, have been taught by the dictating machine to express themselves lucidly.

Fully as important are the advantages which come to the stenographer who uses the dictating machine. It eliminates the most exacting part of her duty—the taking of shorthand. She starts and finishes each letter with one operation—type-writing. She is able to do her work systematically without frequent interruptions to take dictation, and she finds herself doing more secretarial work. She is identified with a scheme which means greater usefulness on her part, and, therefore, a more efficient service to all the other elements of the business.

The most outstanding service of the dictating machine is the saving of time and money it effects. Each letter is written

but once—on the typewriter. That, in itself, adds hours to the day. Since letters can be written more quickly, they cost less. Each one moves faster to the mail chute, because work can be distributed among several girls, while with the shorthand system each girl must typewrite her own notes.

A dictating machine means a better distribution of work, closer supervision, better service to the dictating force through the provision of a service always on hand, tireless in its performance, and limited neither in speed nor capacity. Very often an organization has no plan for handling correspondence, and the dictating machine has been the means of establishing an efficient system.¹ With its use every correspondent works under a certain set of rules. There is a salutary submission to a kind of discipline which suggests the adoption of a policy or standard in correspondence.

The very presence of the machine in the office implies a regularity of transcription. The individual feels a real pride in dictating correspondence in which the personal element demands that the letter be transcribed accurately, much as the dictator visualized it. The grounding of a correspondence system has been made and the psychological argument is strong. The suggestion of a fixed correspondence system is present—the dictating machine has turned the trick. Better work on the part of the dictator and transcriber means better letters. The need for the “better letter” in quantities determines the permanence of this short-cut method of efficient correspondence in modern business.

¹For further information, write to such companies as Dictaphone Sales Corporation and Ediphone Division, Thomas A. Edison, Incorporated, for booklets on handling correspondence.

XXI

TYPEWRITERS

Ancestors of the modern typewriter. Present-day models. Four-bank machines: keyboard; shift keys; special keys; carriage; platens; type. Three-bank typewriters: keyboard; shift keys; special keys; carriage. Portable typewriters. The inspiration of other office equipment.

THE past few years have witnessed an increase in the production per employee, and a great elimination of waste in this production. These two accomplishments resulted from a more extensive use of machinery, which reduced hand and mental operations to a minimum. At one time the mechanizing of office routine was not keeping pace with that of factory routine; of late, however, the same scientific thought has been given to the operation of the office as that which is devoted to manufacturing.

The typewriter was the first machine to edge its way into office routine and demonstrate the possibilities of clerical-labor saving through mechanical appliances.

ANCESTORS OF THE MODERN TYPEWRITER

The first known attempt to invent a writing machine is recorded in the British Patent Office. A patent was granted to Henry Mills, an English engineer, on January 7, 1714. A description of this invention, given in the patent, sounds promising, but no model remains to show how practical was the engineer's work.

William Austin Burt, of Detroit, was granted the first American patent in 1829. The original model was destroyed by fire in the Washington Patent Office in 1836. This typewriter carried type on the segment of a circle instead of on individual type-bars, which would make it

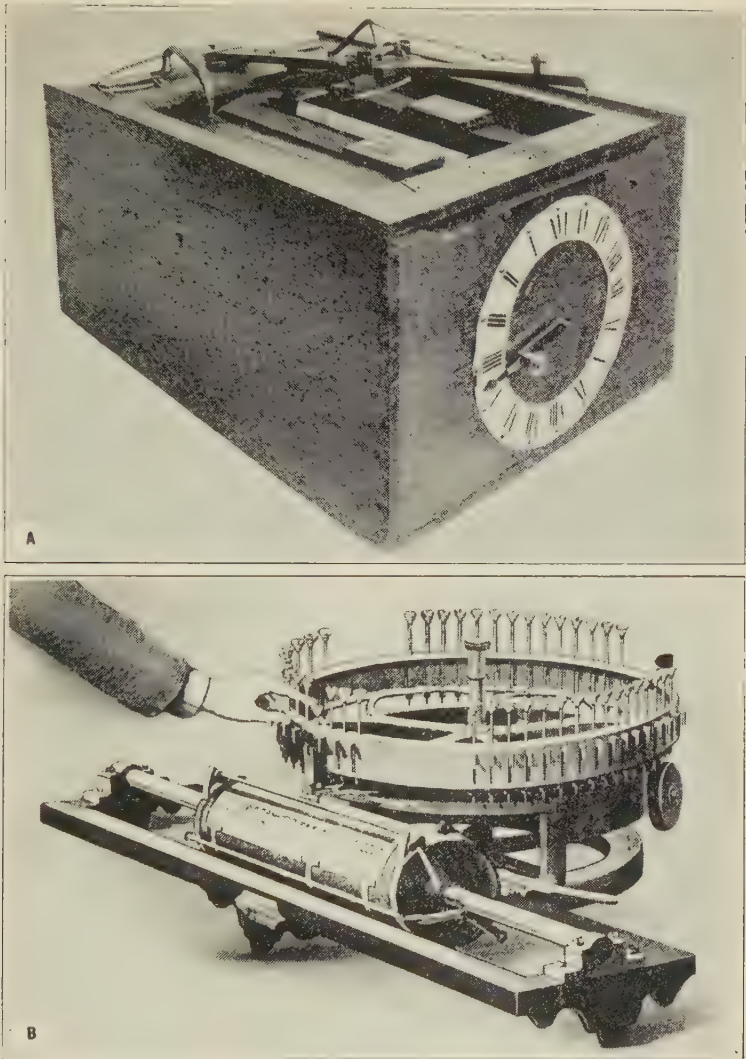


Figure 126: At first glance you might not guess that these contrivances were results of two early attempts to construct a typewriter. The box-like device, built by Burt away back in 1820, was the first writing machine patented in this country. Notice the moving platen of the other, invented by Thurber in 1843.

the original of the modern type-wheel machines (illustration A of Figure 126).

Four years later, in 1833, a Frenchman, Xavier Projean, was granted a patent on a type-bar machine, which he called a "Ktypographic" machine. The principle of construction was based upon individual type-bars set in a circle. When operated, each type-bar hit upon a common center. The idea



Figure 127: The manufacture of typewriters began in 1873. Queer though this first model is in appearance, it possessed a number of features, still standard, which make it the ancestor of all practical writing machines. To Christopher Latham Sholes goes the credit for its invention, as told on page 350.

market was finally produced, the owners carried their machine to E. Remington and Sons, gunmakers, of Ilion, New York, as possible manufacturers for it. Negotiations undertaken with the Remingtons to this end were successful and a contract was signed in the spring of 1873.

However odd this machine may have been in appearance, it had a number of features which are still standard in present-day models. For instance, the type-bars were so arranged that the type printed at a common center; step-by-step escapement provided for the spacing between letters; the paper was fed into the machine around a cylinder; a lever moved the paper up a line; the letters were made on the paper through an inked ribbon which moved with the carriage; it had a four-bank keyboard with 44 keys carrying the universal arrangement of letters.

Probably the greatest limitation of the first typewriter was that it printed capital letters only. In 1878 the first "shift-key" typewriter, printing both capital and small letters, was placed on the market.¹

In 1880, James B. Hammond secured a patent for a writing machine built on the type-wheel principle. The letters were arranged on a wheel in the center of the machine and when a key was depressed the wheel whirled until that corresponding letter came to the printing point and made its impression. This machine appeared on the market soon after.²

A great defect of the earlier machines was that the operator had to raise the carriage in order to see the line which was being written. What is known as the under-stroke principle was responsible for this—that is, the type-bars were arranged in a circular basket under the carriage and the type printed at a common point on the under side of the cylinder. So obvious was the advantage of visible writing that the attention of typewriter inventors was turned to some means of attaining it.

¹Remington Typewriter Company. ²Hammond Typewriter Corporation.

The Horton typewriter, which appeared in 1883, was one of the earliest attempts to invent a visible writing machine.

It used the downstroke principle—that is, the type-bars struck down on a common printing point on the top of the cylinder. The position of the ribbon, however, caused a considerable length of ribbon to be exposed, which interfered with free visibility in writing.

It was Franz X. Wagner who finally solved the problem satisfactorily, in 1894, with a machine whose type-bars were placed in a segment in front of the carriage, the type printing on the front of the cylinder. The machine wrote an entire line visible to the eye without moving or shifting the platen. This feature has a distinct place in the typewriter world, and with the exception of one type all machines now write in this way.¹ Another improvement, the automatic ribbon reverse, was first used in 1896.²

During the first years of its history, the typewriter was used only for straight line-by-line writing—that is, manuscripts, letters, and the like. Unexplored remained the fields of form, tabular, and statistical writing because of the lack of mechanical means for instantly setting the carriage at any desired writing point.

Among the many attempts to produce a practical tabulating device only two are entitled to recognition. Joseph B. Gathright, of Louisville, Kentucky, secured a patent on such a device September 23, 1890. The use of this invention permitted the carriage to move forward from one position to any other desired position, skipping the regular spacing controlled by the rack and indicated by the scale on the machine. For reasons unknown, this patent was not used on any of the typewriters manufactured at that time.³ In 1898 one writing machine appeared on the market with

¹This machine was later placed on the market by the Underwood Typewriter Company in 1897.

²Remington Typewriter Company.

³The Gathright patents were embodied in the construction of the earliest machines manufactured by the Underwood Typewriter Company.

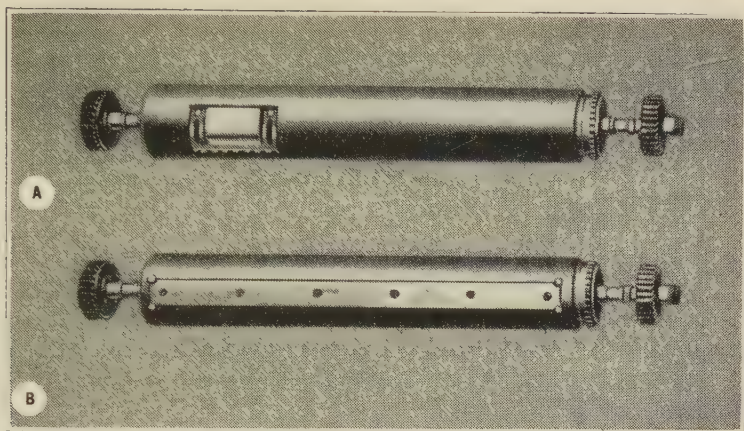


Figure 130: For special work the regular platen may be replaced by one designed especially for a certain kind of typing. A label-writing platen is used by druggists and physicians (illustration A); for card-writing the one shown in B is substituted.

what was known as the Gorin decimal tabulator.¹ By means of this tabulator, the carriage was brought instantly to the printing point in every column where the next line of writing began and allowed for the writing of columns of figures anywhere on the page with the same speed as ordinary writing.

Wide carriages have been designed for loose-leaf bookkeeping, billing, statistical, and bank work. To avoid repetition and to make the treatment as compact as possible, the description of all attachments which seek to broaden the scope of typewriter use is reserved for chapters dealing directly with billing, bookkeeping, and so forth.

PRESENT-DAY MODELS

Nearly all writing machines on the market today are of the type-bar variety. This construction involves all the fundamental principles of the original model of 1873. The steel type-bars are so arranged that they print at a common

¹Used by Remington Typewriter Company in 1898.

center; the step-by-step escapement mechanism provides for letter spacing; the paper is fed around a cylinder called the platen; a lever at the side moves the paper for line spacing, and, in most cases, serves as a carriage-return mechanism. On most machines the type-bars are arranged in front of the carriage so that they strike on the front of the platen when the corresponding keys are pressed. This is called the front stroke.

The arrangement of letters on the typewriter keys has, with minor variations, been standard since the invention of the first writing machine. Both three- and four-bank keyboards have this universal arrangement of letters.

For convenience in describing, typewriters will be classed as four-bank and three-bank machines. A separate section will be devoted to portable machines.

FOUR-BANK TYPEWRITERS¹

Reference to Figure 128, which shows and labels all parts of the typewriter, will help the reader to understand the description which follows.

Keyboard: A diagram of the four-bank keyboard is shown in Figure 129. Notice that there is one row of figures and that special characters and punctuation marks are scattered on these keys. Usually there are 42 keys, writing 84 characters. One machine, however, has 44 keys and writes 88 characters; another writes 92 characters with 46 keys, including eighth of fractions. Two other models have 38 keys and write 76 characters.

Shift keys: Because there are two characters on each type-bar, there must be some means of printing either a small or capital letter, a figure or a punctuation mark at

¹Machines of this type are manufactured by such companies as Demountable Typewriter Company; Remington Typewriter Company; Royal Typewriter Company; L. C. Smith & Corona Typewriters, Incorporated; Smith Premier Typewriter Company; Underwood Typewriter Company; Victor Typewriter Company; Woodstock Typewriter Company.

will. This is accomplished on some machines by shifting the carriage and on others by shifting the type segment. One machine shifts only the cylinder and the paper rest.

Special Keys: Special keys found on all machines are shown and explained in Figures 128 and 129. The location of these keys is not the same on all typewriters, but their functions are identical.

The back-spacer key moves the carriage from left to right.

The marginal release key permits the carriage to be moved so that writing can be done in either margin, when the margin stops have been set for writing a line shorter than the full possible length.

The decimal tabulator keys are used for billing, statement writing, and for any other work where figures must be written in columns. They are used also in general correspondence to bring the carriage to a desired point for the date, salutation, paragraph indentation, or signature.

Some typewriters have one tabulator key only; two machines have an in-built tabulator which is controlled by

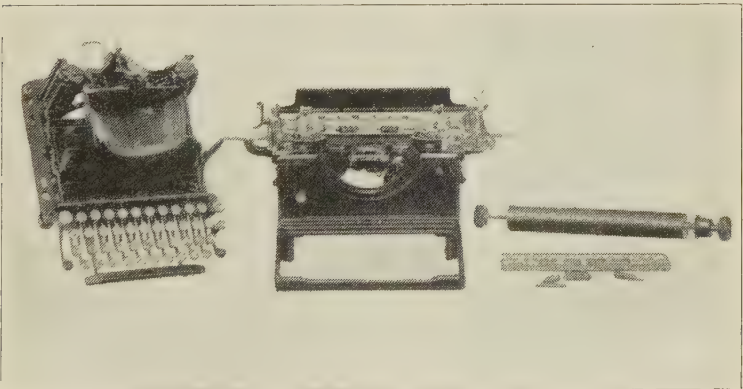


Figure 131: One typewriter can be taken apart and units interchanged with corresponding units of any other typewriter of the same make. Other four-bank machines that vary somewhat from the general description are shown in Figures 132 and 133. All are described beginning page 354.

means of five keys located above the keyboard. Other models have an in-built tabulator operated from ten keys, similarly placed; still others have only one key.

A number of machines provide for the variations in the operator's touch. The keys may be tightened or loosened to suit the operator. On one machine a thumbscrew adjusts the key action; another has an adjusting device for each key.

Carriage: The carriage of the typewriter consists of the hard-rubber platen roll around which the paper is fed and the other parts which move from right to left as a line is written. For an explanation of the various parts, see Figure 128.



Figure 132: A typewriter that is practically noiseless in operation is illustrated here and described on page 359. Its platen is of metal. Another machine that varies a bit from standard construction is illustrated in Figure 133.



Figure 133: Only the small motor of this machine hints of any departure from standard construction. The keys are pressed lightly and then electricity does the rest. Read page 359.

Most typewriters have their carriages mounted on either ball or roller bearings.

Machines with carriages of various widths to take different sizes of paper and write lines of corresponding length are made by all companies (see Figure 134).

By means of the variable line spacer, the operator can start writing at any desired line position on the paper.

*Platens*¹: A platen that can be easily removed and replaced by another without the use of tools is a feature of some machines. Thus, platens of varying degrees of hardness can be used, depending on the number of carbons to be made. This is not only a great convenience to the typist but decreases the number of machines needed where many different kinds of work are done in one office or by one

¹Manufactured by such companies as L. C. Smith & Corona Typewriters, Incorporated.

operator. The regular platen is used when three or four carbons are wanted; the medium-hard and hard platens make possible a greater number of copies, depending on the thickness of the paper and the kind of carbon-paper.

There are also platens for special work—the label-writing platen for druggists and physicians; the library platen for writing library cards; and a card-index platen especially designed for the rapid handling of index cards.

A card-writing platen, which consists of a strip of metal sunk into the rubber and securely fastened to it, is also to be had for some machines. The card is inserted between the edges of the strip and the rubber and can be rolled into the machine from either front or back.

With a brass platen it is possible to make as many as 20 copies if thin paper is used.

All typewriters have two-color ribbons with automatic reverse. All ribbons may be thrown out of position for stencil work.

Type: The various styles of type with which typewriters may be equipped give the prospective purchaser a wide assortment from which to choose. The type-faces most often used are pica, elite, medium roman, gothic, pinpoint, print-type, large and small italic. Foreign-language type is also to be had for many machines.

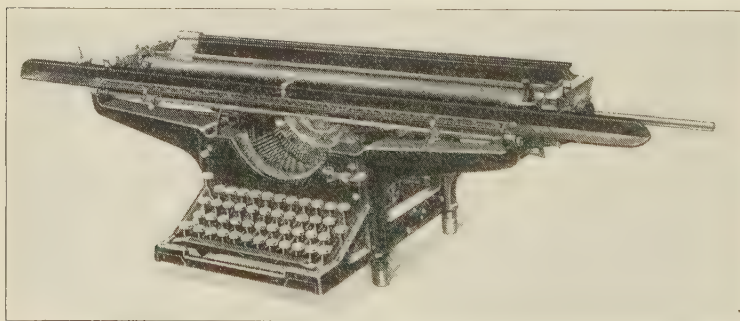


Figure 134: Typewriter carriages of various widths to take different sizes of paper and write lines of corresponding length are made by practically all companies. One of the wider carriage models is illustrated above.

The three main units of one make, the base, deck, action and carriage unit, are demountable and interchangeable with the corresponding unit of any other typewriter of the same make. No tools are required in interchanging. The machine is manufactured in 11-, 14-, and 18-inch carriages and with keyboards of any standard business or language. Keyboards of several different languages may be used in the same typewriter. Noiseless, medium, hard or brass platens are obtainable.¹

A typewriter which is practically noiseless in operation utilizes the principle of pressure printing rather than percussion printing (see Figure 132). By means of a variable pressure indicator the cylinder is so adjusted that the relation of the paper to the type can be made the same whether writing on two sheets or many, and no heavier stroke is required. In "filling in" duplicated letters, the pressure indicator permits the exact matching in shades of impressions. The cylinder or platen is of metal.²

An electrically powered typewriter, which can be operated from either a direct or alternating current, is shown in Figure 133. Its structure follows closely that of the standard model of the same make. The machine is so built that only one key can be engaged at a time, and it has an impression regulator which makes it possible to get either a heavy or light imprint. A light touch to the keys—about a quarter of an inch depression—and electricity takes up the burden.³

THREE-BANK TYPEWRITERS

Two writing machines with three rows of keys are shown in Figures 135 and 136. First, a general description of this class of typewriters will be given, and then each model will be accorded separate treatment.

¹Made by such companies as Demountable Typewriter Company.

²This type of machine is made by such companies as Remington Noiseless Typewriter Corporation.

³Manufactured by such companies as Woodstock Typewriter Company.

Keyboard: It will be remembered that the arrangement of letters on the three-bank machine is the same as that on the four-bank variety (see Figure 129). The difference is that there is no row of keys for numerals; they, as well as special characters and punctuation marks, appear on the letter keys. The number of keys varies from 28 to 35. The typewriter pictured in Figure 135 writes 90 characters; the one in Figure 136 writes 84. A mathematical model of the same make as Figure 136 writes 120 characters.

Shift Keys: There must be a double shift on machines of this class, because there are three characters on each type-bar; one of these shifts is for figures and the other for special characters and punctuation marks.



Figure 135: This typewriter is built on the type-wheel principle—that is, the letters are arranged on a wheel which whirls until the character corresponding to the key depressed comes to the printing point and makes its impression. Other features are described on pages 361 and 362.

Special Keys: These are practically the same as those of four-bank machines and will therefore not be described again.

Carriage: Three-bank machines have carriages like those of four-bank machines.

In Figure 135 is shown a machine which utilizes the type-wheel principle. The letters are arranged on a wheel in the center of the machine. When a key is depressed, the wheel whirls until that letter comes to the printing point and there makes its impression.

Most interesting of its features are the two languages and two styles of type which are always in the machine. A knob in the center of the type-wheel is turned to change from one to the other. A small lever to the right of the machine changes the spacing of characters from the standard 10 characters to the inch to 14 or 18 characters, to fit the width of type placed in the type-wheel. The interchange-

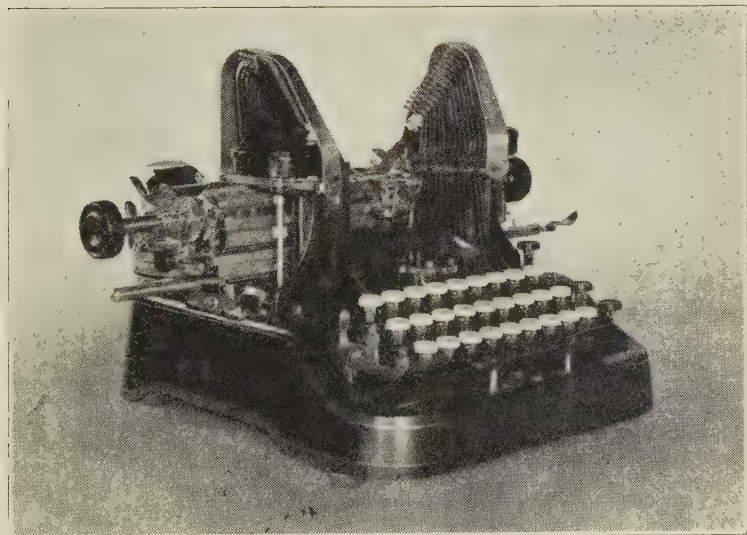


Figure 136: Note the arrangement of the U-shaped type-bars which fly down, rather than up, to a common printing point. This typewriter belongs to the three-bank class, described in detail beginning on page 359.

able type-bars are changed in a few seconds and place at the operator's disposal 17 different styles and sizes of type and over 50 languages. The machine has open carriage ends, permitting the use of any width of paper; ball-bearing carriage; capital and figure shifts on each side; dual-color ribbon; and all other devices common to present-day typewriters. This typewriter has a three-bank keyboard with the universal arrangement of characters.¹

The essential features of the typewriter illustrated in Figure 136 are the U-shaped type-bars and the "down-thrust" of these bars as contrasted with the more universal "upthrust" of other typewriters. The type-bars, arranged in two perpendicular rows, one in each side of the machine, fly down to a common printing point on top of the platen, rather than up, when the corresponding keys are depressed.

Like the machine described above, this make has a three-bank keyboard. It has, also, a rimless keytop which holds the figures in place, and all features of the writing machine.

One model of this make is equipped with a ruling device for marking either vertical or horizontal lines without touching the type or ribbon. A disappearing indicator, which shows the operator the precise printing point, is also a part of this machine.²

PORTABLE TYPEWRITERS³

Compact and light enough to be easily carried, the portable typewriter is serving the need of the individual for a personal writing machine. It is a handy companion for the traveling man, who saves time by typing his reports, orders, letters, and the like; the doctor uses the small machine for billing, keeping up his card index of cases, and

¹Manufactured by such companies as Hammond Typewriter Corporation.

²Made by such companies as Oliver Typewriter Company.

³Manufactured by such companies as the L. C. Smith & Corona Typewriters, Incorporated, Hammond Typewriter Corporation; Remington Typewriter Company; Underwood Typewriter Company.

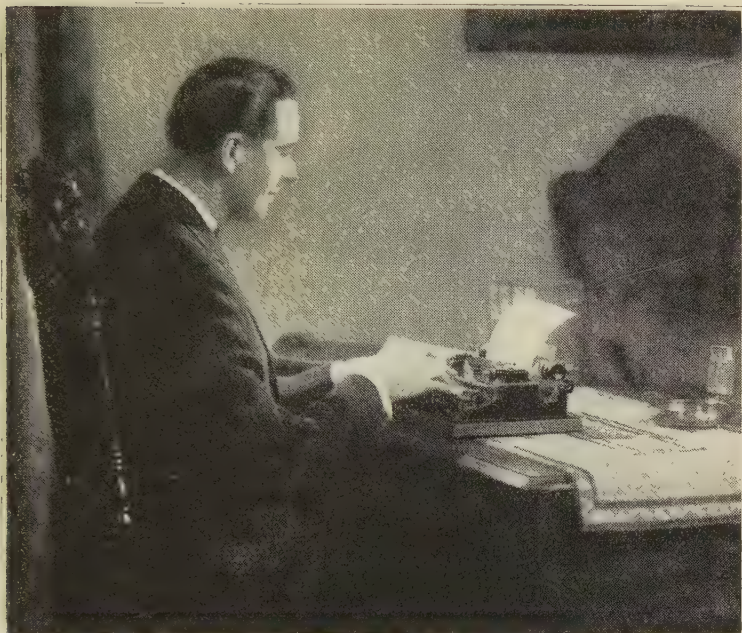


Figure 137: Doctors, clergymen, lawyers, engineers, college students, business men are buying portable typewriters because they are easily carried and are ready at all times to save their minutes. Special keyboards for those whose work entails the writing of special symbols are available. One is shown in Figure 138. Read more about portable machines on page 362.

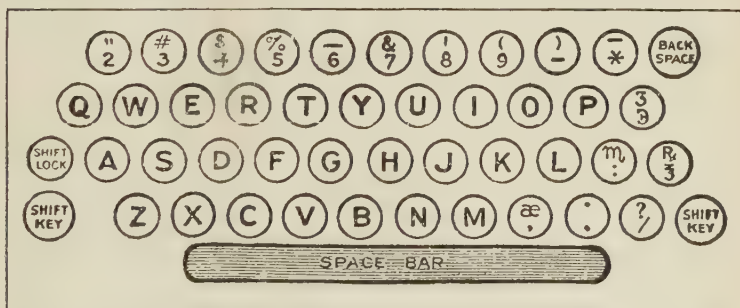


Figure 138: There are many reasons why the portable typewriter is widely used. The special keyboards obtainable make them valuable to the professional man. Here is a druggist's keyboard containing the special symbols used in pharmaceutical work. Engineers, doctors, chemists, optometrists can be supplied with keyboards to fit their requirements.

for correspondence; the storekeeper who has no stenographer does his billing, statement writing, order writing, and correspondence on the portable; in the home every member of the family finds some use for it. For the druggist, the engineer, the clergyman, the writer—in fact, for any one who has any writing to do—it is convenient, speedy, and practical.

The construction of the machine embodies many features common to the standard office typewriter. The machine is usually secured to the bottom of the case, which provides a permanent base and makes its use convenient under all conditions. Some machines are non-folding; the carriage of one model folds over the keyboard when the cover is put on; the keyboard of another folds upward when the machine is not in use; still another has type-bars which are lowered from writing position when the machine is locked in its case.

The weight of these machines varies from 7 to 12 pounds according to the make.

Like the larger typewriters, portables may be classified as three- and four-bank machines. There is a wide selection of special keyboard and type arrangements for engineers, chemists, doctors, optometrists, and all those requiring special symbols and extra characters. A druggist's keyboard is pictured in Figure 138.

THE TYPEWRITER INSPIRED OTHER OFFICE EQUIPMENT

The idea embodied in the first typewriter, that of clerical-labor saving, was even greater than the machine itself, for it was the inspiration afforded by this idea which led later to the development of the computing or calculating machine, the adding machine, the accounting machine, the duplicating machine, the addressing machine, and all the other labor-saving office appliances of the present day. The influence of the idea embodied in the first typewriter has been even wider than the clerical-labor-saving field, for

the basic principles of its construction furnished the suggestion and inspiration to the inventor of the linotype and other improved typesetting devices. It would be difficult to trace all of the ideas and improvements which have originated from this common source, and it is amazing to consider that this total development in every one of its phases has come about in the last half-century.

XXII

TYPING AIDS

Increasing typing efficiency. Copy-holders. Why your typist should use a copy-holder. The automatic envelope feeder. How the envelope feeder increases production.

THERE was a time—and that isn't so very long ago—when the manager of a business office considered his equipment for the production of letters and records complete the moment he had provided his stenographer with a typewriter. Of course this was a great step in advance of handwriting, but of late years it has not been found sufficient; the matter of conserving the time and energy of stenographers, as well as increasing their efficiency, has received careful study and analysis, and various ingenious devices have been invented which are a great help to typewriter operators.

In this section two devices designed with this aim will be described. One of these—the copy-holder—increases transcribing efficiency; the other—an attachment for automatically feeding envelopes and forms to the typewriter—increases production by eliminating time lost through hand feeding.

TRANSCRIBING DEVICES¹

As the typewriter occupies the desk space directly in front of her, the typist is compelled to strain her body and eyes in the endeavor to read from her note-book which is ordinarily placed at one side. As a result, not only is her physical well-being endangered, but her speed is hampered as well, because her notes are not at the proper place for reading.

¹Made by such companies as Error-No, Incorporated; The Line-A-Time Manufacturing Company, Incorporated; and the Nielson Supply Company.

Scientifically designed copy-holders do not merely "hold" the matter to be copied, they support it in such a way that it can be moved up as required so as to provide the correct reading area. This area is fixed by the stationary bar just high enough to enable the operator to sit in a comfortable,

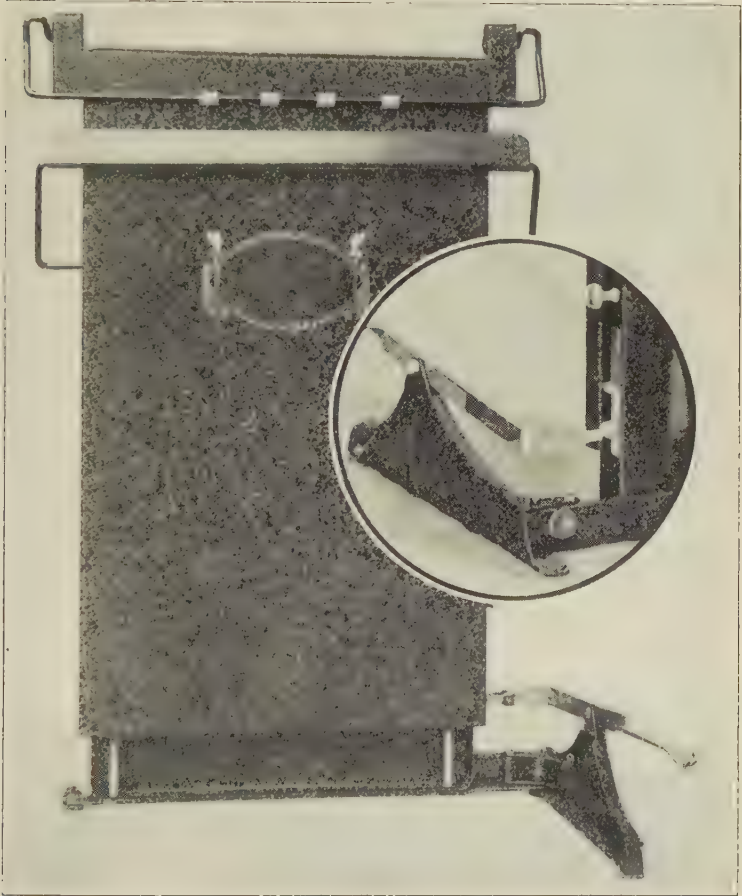


Figure 139: Science and mechanical skill, by eliminating bodily fatigue and eye-strain in transcribing notes, make the stenographer more valuable both to herself and her employer. The copy-holder shown above is one type available; the line-spacing mechanism is illustrated in the insert.

upright position. The distance from the eyes should be normal for reading, so as to remove practically all strain.

One type of copy-holder, correctly designed to increase transcribing efficiency, consists of a metal plate for carrying copy to be transcribed. The entire device is small enough

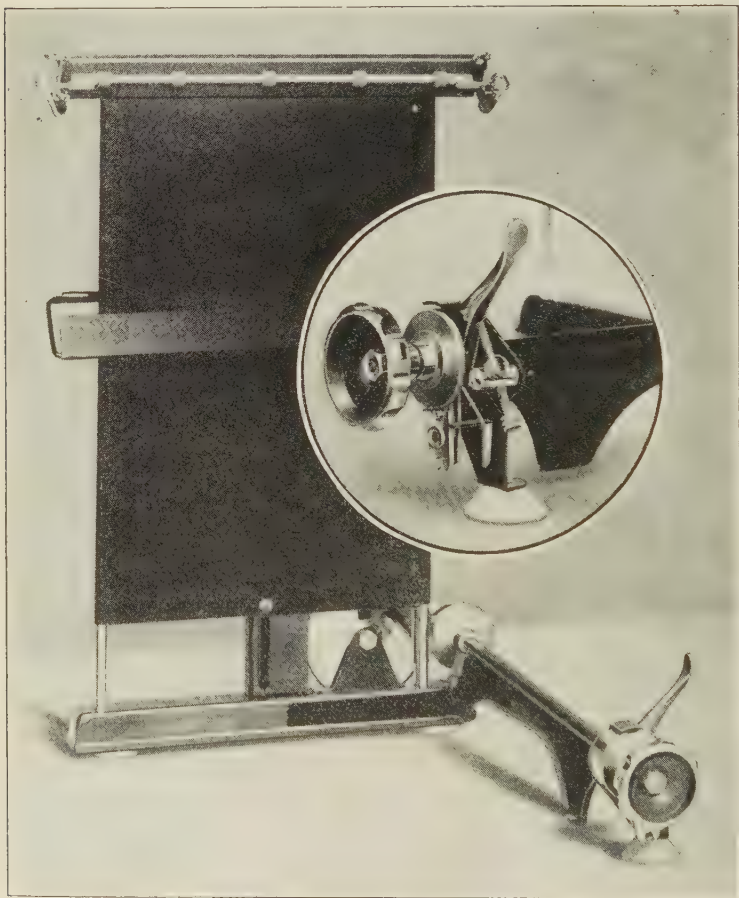


Figure 140: A copy-holder not only holds the stenographer's notes so she can sit in a comfortable, upright position, but it confines the area from which she reads to a small space. The device illustrated above is another type available; the line-spacing mechanism is illustrated in the insert.

to be placed directly behind the typewriter or at one side. A bar, called a line finder, extending across the face of the plate, marks the reading place. On some models this bar is stationary and the plate holding the copy is moved up and back of it to the exact height desired. The plate of one device is stationary and the bar drops down automatically at the touch of a control key. A device in position with the typewriter keyboard controls the operation.



Figure 141: Another type of copy-holder which has found a place in offices is shown here. The shelf may be tilted to any angle and locked. Like the models shown in Figures 139 and 140, it is also equipped with adjustable line indicator and spring-clip leaf-holder.

Two or three lines of the note-book—enough to transcribe a line on the typewriter and allow for some reading ahead—are first adjusted above the line finder by means of an operating device which varies slightly with the several makes. By operating the control device several lines of copy are brought into position to allow comfortable reading of the matter for the next typewritten line.

A spacing device which provides for transcribing from variously spaced copy may be set for regularly spaced copy, widely spaced copy, or for very fine print.

Such copy-holders may be had in various widths ranging from 12 to 44 inches.

Some models are designed for use with all makes of adding, calculating, bookkeeping, and typesetting machines as well as typewriters. One company makes a model equipped with a "luminous" lens that magnifies the matter to be read.¹

Another model² has a shelf which may be tilted to any angle (see Figure 141) and locked. This device is also equipped with adjustable line indicator and spring-clip leaf-holder. The base is weighted to prevent toppling and has a protected rubber ring to prevent scratching the desk top.

WHY YOUR TYPIST SHOULD USE A COPY-HOLDER

Transcribing with the aid of one of the devices just described preserves the health and well-being of the operator by correcting her posture and relieving eye-strain and the resultant nervous effects.

Increased efficiency, the aim of every organization, is accomplished because:

1. The matter to be transcribed is held in front of the eyes, enabling the operator to read with less strain, greater accuracy, and more speed.
2. About 95% of the causes of errors in old reading methods are removed.

¹Manufactured by such companies as The Line-A-Time Manufacturing Company, Incorporated.

²Manufactured by such companies as the American Electric Company.

3. Desk space is saved.
4. The accumulative loss of time ordinarily caused by hunting for the next line to be transcribed is eliminated.
5. Greater production is possible.

Such devices, with no lost motion in the routine of an office, demonstrate their value on:

Stenographers' notes	Statements
Invoices	Printed forms
Listing	Production costs
Contracts	Accounting reports
Ledger posting	Route sheets
Billing	Debit and credit tickets
Stencil work	Bank deposit slips
Auditing	Specifications
"Fill-in" letters	Sales orders and reports
Pay-roll	Advertising copy
Inventories	Deeds and mortgages
Reports	Pay forms

THE AUTOMATIC ENVELOPE FEEDER

Although designed primarily for envelope feeding, the automatic envelope feeder is also capable of feeding cards, form letters, statements, and invoices to a typewriter.

Two models are in use—one operated by hand; the other by motor. Mechanically they are the same, except, of course, that greater production can be secured with the motor-driven machine.¹

The envelopes are retained in a hopper at the back of the machine (see Figure 142). At the touch of a button on the motor-driven model, an envelope is fed into the exact position for typing the first line. When the address is completed, the typist again touches the button (or depresses the foot treadle) and the next envelope falls into position. The completed envelope rises into position to be removed by the typist and stacked at the left-hand side of the machine. The feeding, removing, and counting are all done automatically.

¹Sold by such companies as The Speed-o-Feeder Sales Company.

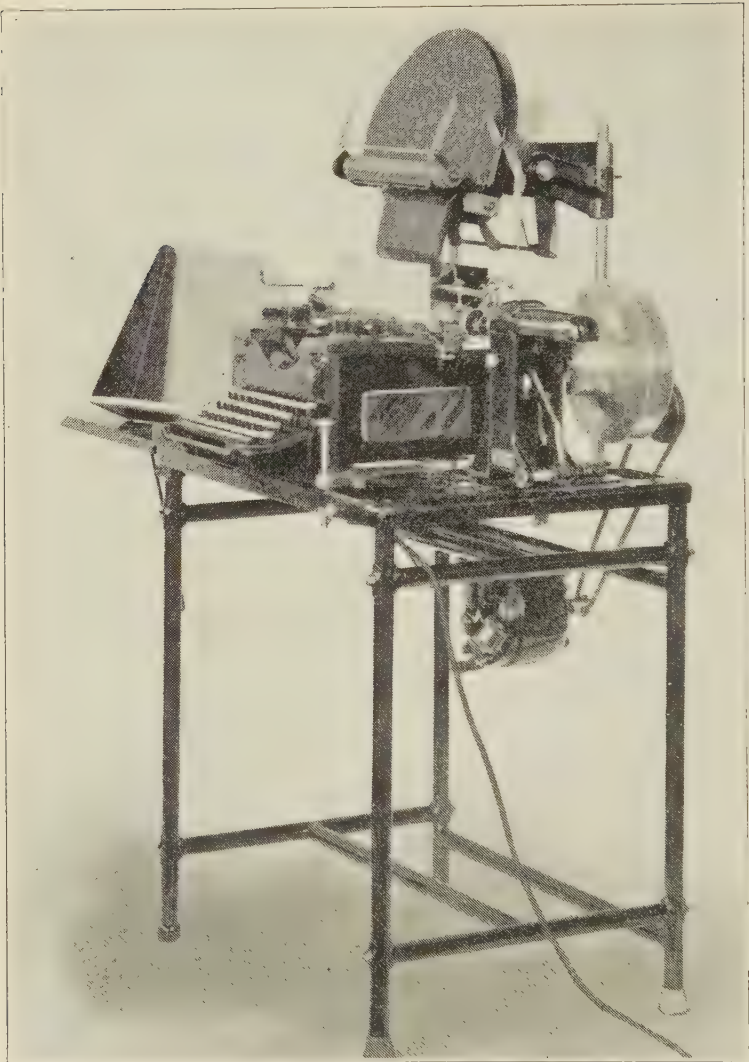


Figure 142: Another appliance to increase the typist's efficiency is this device which automatically feeds envelopes or forms to the typewriter. Relieving her of those wearisome, time-wasting motions which tire her out, the automatic envelope feeder makes it possible for her to turn out twice as much work. This labor saver is described on page 371.

An automatic list-holder, which moves a written or printed list around the platen one line at a time directly before the eyes of the operator, is a part of the equipment. There is, also, a card-holder placed at the right in case the work is being done from cards. Other standard accessories include a counter, an envelope-stacking holder, and shelves to afford a convenient work-place. The hand-operated model can be detached if the typewriter is to be used for straight typing.

HOW THE ENVELOPE FEEDER INCREASES PRODUCTION

In addition to the saving of time due to increased production by each operator there are other advantages upon which many users place even more importance. Reduced labor turnover is among them, as well as speed in handling huge volumes of addressing which occur periodically, and ability to get out sales letters, new price lists, or orders in less time.

Firms which have occasional or spasmodic addressing "peaks" find the device as profitable an investment as do mail-order houses, addressing concerns, and large users of direct mail.

XXIII

DUPLICATING MACHINES

The versatility of duplicating machines. The first machines for making multiple copies. The five kinds of duplicating machines. Stencil duplicators. Gelatin duplicators. Clay-composition duplicators. Machines which utilize the typesetting principle: machines which print from typewriter type; machines which print from printers' type. Automatic typewriters. The place of duplicating machines in business.

EVERY department in every business uses many copies of the same data each day. All tedious and expensive re-typing of such matter is eliminated by the duplicating machine, which, from one original, makes the required number of copies in the quickest possible time, at the smallest fraction of cost.

Whether the copying work is the making of notices, bulletins, reports, or the production of charts, graphs and maps in colors, or illustrated sales literature, or house organs, or sales letters, or the duplicating of orders and invoices, there is a duplicating machine which will serve the purpose accurately, speedily, and economically.

In the production department these devices provide an easy way to get out notices and instructions to foremen, together with bulletins, job orders, lists, change notices, and all such written matter that should reach many people at the same time.

In promotion departments they are used for making copies of house organs, reports and charts to salesmen and departments, plans, proposals, and market reports.

For the accounting department, audit and account analyses, ruled forms, report blanks, statements, statistical reports, proof of earnings, and trial balances are made.

In the sales department duplicating machines are used for making copies of letters to salesmen, inspirational bulletins,

price changes, comparative reports. They serve as a link between headquarters and the man on the road, and the sales department and the jobbers and dealers who sell the company's product. Such close supervision increases sales results. Drafting departments put the devices to good use in reproducing drawings and tracings.

Copies of specifications, proposals, drawings in several colors, and change notices to contractors are made by these machines in engineering departments.

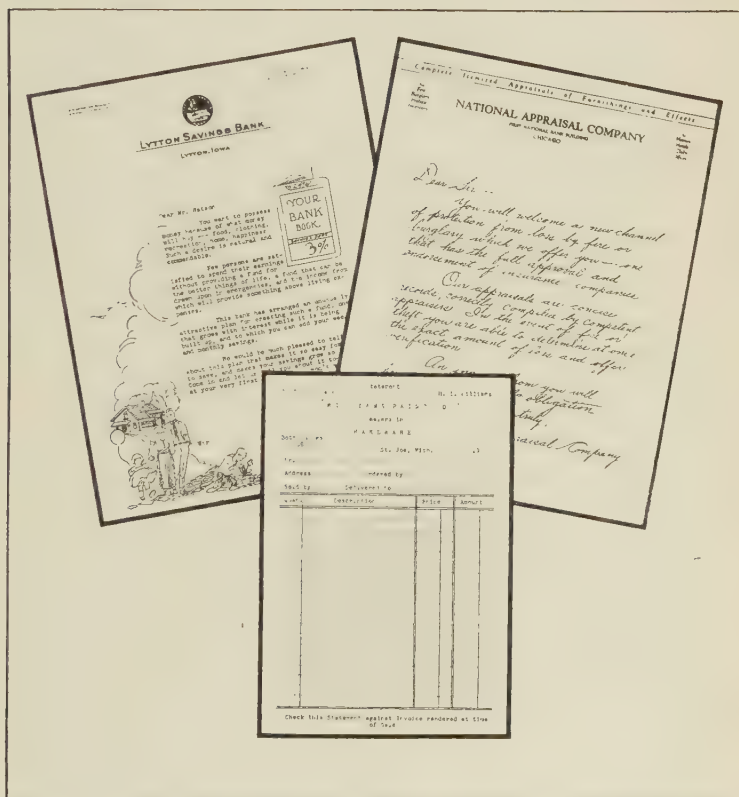


Figure 143: A duplicating machine is an accurate, speedy, and economical device for the copying of sales letters, bulletins, charts, maps, and house organs, or for reproducing anything handwritten, typewritten, or drawn.

For the order department, a complete set of orders and invoices, including tags, labels, bills of lading, and card copies for manufacturing departments, are reproduced from one original without rewriting.

In advertising departments they get out letters, booklets, blotters, folders, and similar advertising material, advance copies of advertising, schedules to branches and executives, monthly reports, requests for dealer helps, copies of layouts, sketches, plans, and other forms.



Figure 144: Bright electric rays, projected through the glass top of this drawing table, penetrate the drawing and stencil, bringing out the lines which the operator traces with a stylus. Typewritten or handwritten matter may be placed on the stencil and the two reproduced on the machine shown in

Figure 145. See page 382.

One of the great saving powers is demonstrated by the work of these duplicating machines in the direct-by-mail field, where legions of people are reached at the same time by letters made quickly and economically. Every step—



Figure 145: From 1,500 to 5,000 copies can be run off in an hour on a stencil duplicator, depending on whether it is hand or motor driven and whether hand or automatically fed. Figure 146 shows how the stencil is fastened to the revolving cylinder. A description of machines of this class, together with details of operation, begins on page 382.

the printing of the letter-head, the reproduction of the letter itself, the signature, the enclosure which goes to augment the sales talk—can be produced with a duplicator. Every medium of convincing prospects by mail can be made—folders, attractive colored booklets, illustrations, and so forth.

These are only a few of the ways in which duplicators are being used to speed up business, eliminate costly errors, and make prompt, efficient service to customers possible. Now, before passing on to the descriptive matter, something must be told of the origin of the several types of machines on the market today.

THE FIRST MACHINES FOR MAKING MULTIPLE COPIES

A machine for making multiple copies was first built in this country in 1887.¹ This early machine was the forerunner of the present-day stencil duplicator. It was constructed so that the stencil and the impression paper were placed in a flat frame. Ink was then applied to the stencil which was in position over the paper.

The next machine to be put on the market (1901) utilized the gelatin process originated in Germany in 1880 by Alexander Shapiro. This means of duplicating was a roll coated with a composition of glue and glycerin.

When an original copy was laid on this substance, the impression was left on the damp surface, and blank sheets placed on the roll received an imprint of the original. The machine itself consisted of a wooden cabinet with a printing platform over which the gelatin roll was stretched and held in place by means of ratchet wheels.²

Still another type of duplicator was originated at the beginning of this century when an inventor conceived the idea

¹This machine was the A. B. Dick Mimeograph.

²The Shapirograph Company, established in 1901, made this duplicator. At first gelatin rolls were imported from Germany, until 1911, when a factory was built in New York and the rolls manufactured there. This company now operates under the name of Graphic Duplicator Company.

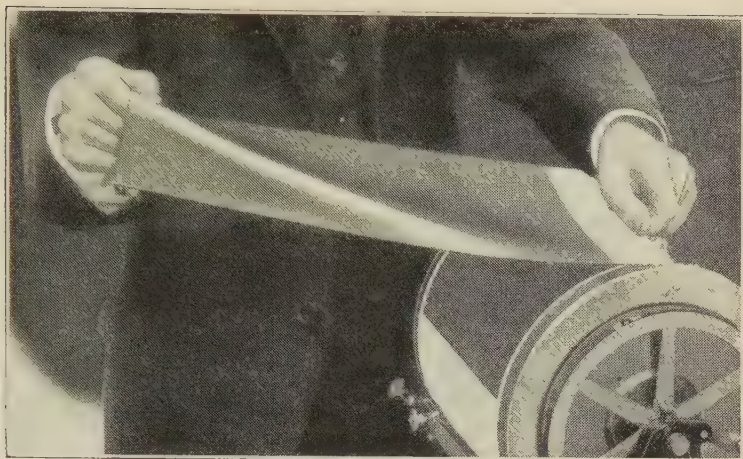


Figure 146: The method of attaching a stencil to the cylinder of a stencil duplicator is demonstrated here. When the crank is turned, the cylinder revolves, bringing the stencil in contact with the paper, fed to the machine either automatically or by hand. Ink passing through the letters cut in the stencil makes the impression.

of a duplicating machine which would reproduce copies from type. His first model, which appeared in 1902, printed through a typewriter ribbon from typewriter type attached to a rotary drum.¹

Still later, in 1907, a machine which combined the printing and duplicating process was placed on the market. This device was a flat-bed printing press, which printed from printers' type in either one or two colors at one impression from printing ink, and, with the addition of a ribbon, printed a third color.²

This covers briefly the first successful attempts to build machines for producing multiple copies. Improvements on, and variations of, those first machines have brought the art up to the point where there is a machine for every possible

¹Harry C. Gammeter invented this machine, which was the first Multigraph manufactured by The American Multigraph Sales Company, incorporated in 1902.

²This machine was the invention of John F. Mahlstedt and was manufactured by the Lisenby Manufacturing Company first in 1909 under the name of the Multicolor Press.

copying need, from the printing of shipping labels to the production of actual typewritten letters.

It seems wise to explain at this point that, although most duplicating machines are adapted to all-round duplicating, some are built primarily to take care of one kind of work and others designed more especially for another kind. The several types may perform a number of duplicating tasks with equal efficiency, yet one may do work which the other cannot accomplish.

Application to the work is, then, the main point to be considered in the selection of a duplicator. Speed, ease of operation, durability, and cost will, of course, come in for their share of thought.

From among the many very capable machines on the market the prospective owner should have no trouble in choosing one which will suit both his needs and his pocket-book. In passing, it may be stated that the range of price is greater for this device, perhaps, than for any other office tool. For

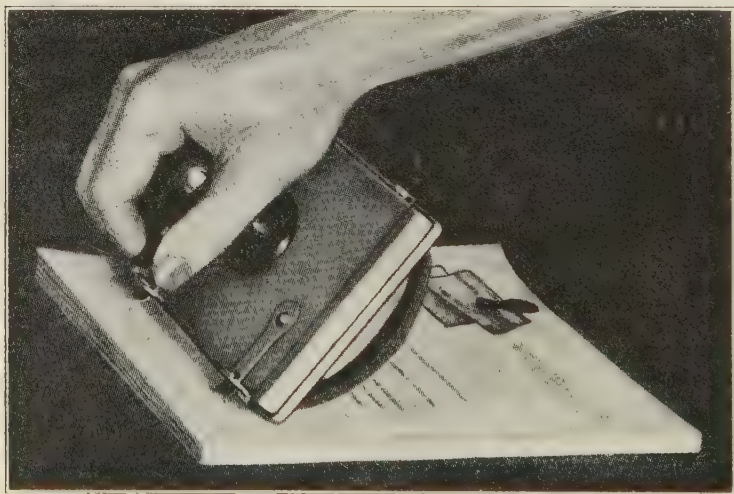


Figure 147: This small stencil duplicating device is used for making return cards, notices, envelope addresses, and the like. The stencil is cut by a type writer or stylus pen and adjusted to the base. For a complete description, see page 384.



Figure 148: Multiple copies are made on this duplicator by bringing the blank sheets one at a time in contact with the gelatin surface which has received the impression from an original copy placed face downward upon it. This machine may be had in several models and sizes. Means for feeding the sheets vary with the several makes. Refer to pages 385 and 386.

about \$30 one can purchase a small duplicator, and from that amount prices climb all the way up to \$4,500 for a machine which writes and fills in letters at the same time.

THE FIVE KINDS OF DUPLICATING MACHINES

Five distinct methods of making multiple copies are in use today: the stencil process, the gelatin process, the clay process, the typesetting process, and the automatic type-writing process. The automatic typewriter could, perhaps, be classed as a stencil duplicator, inasmuch as it works from a stencil; but the fact that it is a typewriter automatically driven makes a separate division seem necessary.

In the following sections a general description of each type will be given, and machines of distinctive construction will be treated in some detail. First under this scheme of handling come the stencil duplicators.

STENCIL DUPLICATORS¹

Exact reproductions of typewritten work, as well as of maps, charts, in fact, any kind of drawings or illustrations, can be had with stencil duplicators.

Stencils. The stencil is placed in a typewriter from which the ribbon has been removed so that the letters are cut instead of being printed, thus exposing the fibers through which the ink can pass when the stencil is placed on the machine.

By means of a stylus, illustrations and drawings and handwritten matter may be stenciled. One manufacturer makes a special device for facilitating drawing²—the drawing table pictured in Figure 144. An electric light placed beneath the glass top penetrates through the drawing which is being traced and through the stencil fastened over the

¹Machines of this type are made by such companies as the A. B. Dick Company; The Heyer Duplicator Company, Incorporated; Rotospeed Company; Underwood Typewriter Company.

²Manufactured by the A. B. Dick Company.

original. Original, as well as tracing work, can be done on this drawing table. Typewriting and handwriting may be added to the same stencil and the whole reproduced on the duplicator shown in Figure 145.

Machines. The design of these duplicators, as may be seen from Figures 145 and 146, embodies a hollow, perforated revolving cylinder partially covered with an ink pad. The ink is applied to the inner surface of the cylinder and passes through the perforations to the pad and openings of the stencil.

To make the copies, the stencil is fastened to the cylinder over the ink pad (see Figure 146). A turn of the handle causes the cylinder to revolve, thus bringing the stencil in contact, under light pressure, with the paper which has been



Figure 149: Copies are reproduced on a gelatin duplicator from an original prepared with a special duplicating ribbon, duplicating ink, indelible pencil, or duplicating printer's ink. Different colors can be copied at one time. Paper is fed to the surface of this model by means of a feeding tray.

fed to the machine. The ink, by capillary attraction, passes through the letters or designs cut in the stencil to the paper, making an impression. Removable cylinders, allowing for the substitution of another when it is desired to reproduce two colors, are found on various machines.

One machine is equipped with automatic feeding devices which bring a sheet of paper to the cylinder with each turn of the crank; others are fed by hand. With this class of duplicator, from 1,500 to 5,000 copies can be made in an hour, depending on whether the machine is electrically driven or hand or automatically fed.

Another very different device which duplicates by means of a stencil is shown in Figure 147. It looks much like a rubber hand stamp and consists of a metal frame with a

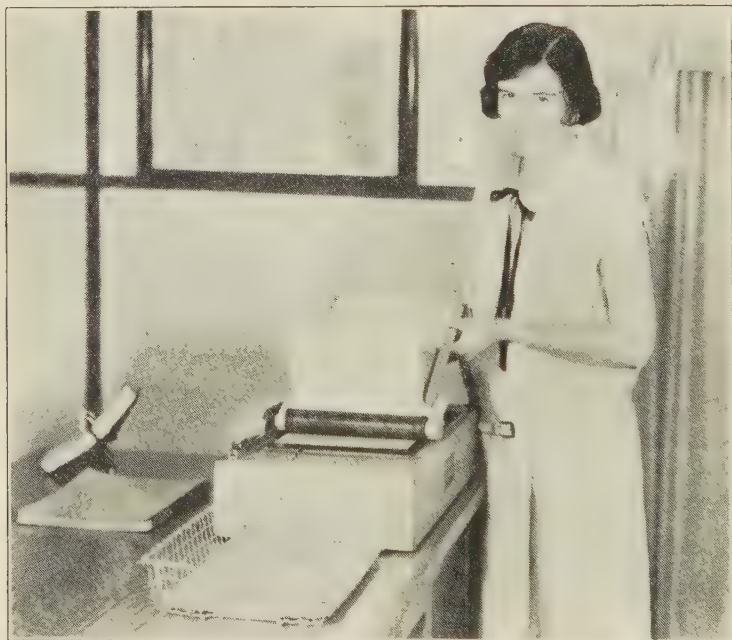


Figure 150: Another type of duplicator has a gelatin pad instead of a gelatin-covered roll. Notice that the paper is fed through rolls to the copying surface. See page 386.

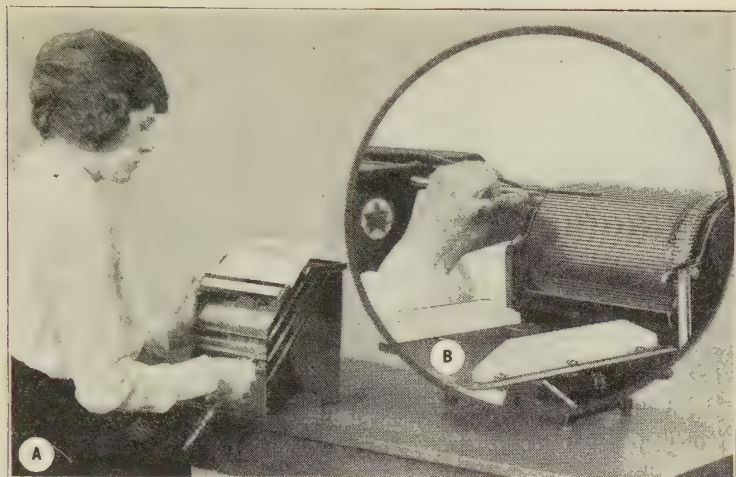


Figure 151: This is one method of composing matter to be copied on the machine illustrated in Figure 153. The type is picked from the channels of the typesetting unit shown in A and transferred, a line at a time, to the printing segment illustrated in the insert B. Figure 152 shows another means of composition. See page 388.

felt ink pad attached to a perforated base through which the ink is fed. The stencil (similar to those used on some addressing machines) is cut with the typewriter or by hand with a stylus pen and adjusted to the stamp, and impressions are made by direct pressure. This device¹ is especially useful for making return cards, office and shop forms, bulletins, notices, envelope addresses, and the like.

GELATIN DUPLICATORS

This class of duplicators makes copies by transferring the ink from a typewritten, handwritten, or drawn original to a duplicating composition which dissolves and holds the ink on its surface until all the copies have been run off.

When preparing the original, hard bond paper and a special kind of ink are used. This may be in the form of a

¹Manufactured by such companies as The Multistamp Company, Incorporated.

duplicating typewriter ribbon, a duplicating ink, or even an indelible pencil. Different colors may be combined on one original.

This type of duplicator (Figures 148, 149, and 150) consists of a flat printing bed over which is stretched a gelatin-covered roll held in place at each end by spools. After one surface of the roll has been used, a fresh one may be brought into position by the turn of a handle.

The original is placed face down on the copying surface and smoothed with the palm of the hand or a roller provided for that purpose. It is then lifted off, having left its impression on the gelatin. The blank sheets are placed one at a time on the gelatin surface and allowed to remain a few seconds until the imprint is made.¹

A gelatin pad instead of a roll is used on one duplicator. The ink is removed by washing the pad after the required number of copies of an original have been made. As may be seen from Figure 150, the paper is fed through rolls to the copying surface.

Some machines are equipped with a device for feeding the sheets to the surface.² The original is inserted in the traveling carriage of one model and the carriage pushed forward until the sheet lies flat and in contact with the gelatin surface. Blank sheets are fed in the same way. A backward pull of the handle brings them back into the operator's hand. A supply of blank sheets is placed in the paper-feeding tray of another model and fed one at a time.

A gelatin-composition sheet attached to a metal half-segment forms a small duplicating device. Originals are either typewritten, handwritten, or drawn. The matter to be reproduced is transferred to the surface by the same method used with other gelatin duplicators. A simple rock-

¹Duplicating devices of this type are made by such companies as Alexander Sales Company; The American Duplicator Company; Duplico Manufacturing Company; Graphic Duplicator Company; The Heyer Duplicator Company; United States Duplicator Company.

²Machines of this kind are manufactured by such companies as The Beck Duplicator Company; Ditto, Incorporated.

ing motion of the segment transfers the impression to the blank paper. This duplicator will copy in bound books.¹

CLAY-COMPOSITION DUPLICATORS²

Small devices which reproduce copies by means of clay composition are also available for duplicating. The original is made with special ink on hard paper and placed face down on the printing surface. It is then lifted off and a clean sheet laid on to receive the impression.

DUPLICATING MACHINES WHICH UTILIZE THE TYPESETTING PRINCIPLE

Duplicating machines which utilize the typesetting principle are of two kinds: One prints from typewriter type, the other from standard printers' type, electrotypes or plates. Certain machines combine both features but are described under classifications below.

*Machines Which Print from Typewriter Type.*³ Figure 153 pictures a machine which prints from typewriter type through a ribbon direct from type affixed to a cylinder. Briefly described, this duplicator consists of a frame supporting a printing drum, to which is attached a removable metal semicylinder with grooved rails. This segment is seen in Figure 151.

The letter, or whatever is to be reproduced, is set up in the typesetting unit (Figure 151), which consists of three type banks mounted on a metal frame. The upper bank contains figures and special characters, the middle bank capitals, and the lower bank small letters. By means of a

¹Devices of this kind are made by such companies as the Duplico Manufacturing Company.

²This class of machine is manufactured by such companies as The American Duplicator Company; The Heyer Duplicator Company; the National Duplicator Company.

³Equipment of this kind is manufactured by such companies as The American Multigraph Sales Company; Individualizing Company of Illinois.

composing fork the type is picked up from the channels of the banks and as each line is composed it is transferred to the printing segment. Or, the type may be set by the electrically operated composing machine shown in Figure 152. A three-bank typewriter keyboard controls the electrically indexed die carrier which embosses the characters on a thin aluminum ribbon fed through the machine from a reel mounted to the left. The ribbon, which has been bent at the edges as it passed through the machine, is cut off at the end of each composed line and the strips are pushed in-

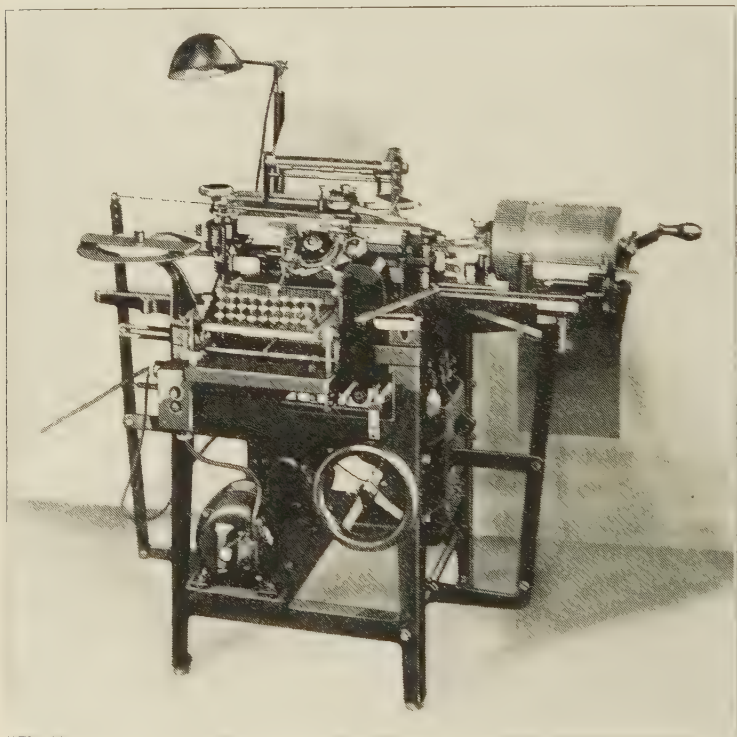


Figure 152: Matter to be copied on the duplicator seen in Figures 153 and 154 may be set on this keyboard composing machine. Note the metal strip, fed from the coil at the left, and the disk with the composed matter on it at the right. A 30-line letter can be set in from 10 to 12 minutes.

to position on the disk which fits over the drum of the duplicator. Raised studs or buttons hold the type from slipping in any direction. The return of the mechanism to compose the next line automatically advances the disk one, two, or three spaces, according to the spacing. The margin is automatically controlled. When a complete letter has been composed, the disk is placed on the drum of the duplicating machine and the letter run off. The strips are then removed and thrown away, or the disk folded either flat or on edge. Tabulating stops may be set on the



Figure 153: After the letter has been composed on either device shown in Figures 151 and 152, the printing segment is placed on the drum and covered with a typewriter ribbon. A signature device which signs each letter as it is run off may be attached if desired. For complete description, read the section beginning on page 387.

graduated dial just above the keyboard, thus allowing tabulation as on a typewriter.

When the type has been set, the printing segment is locked in place on the machine and covered with a broad typewriter ribbon. As the printing drum revolves, each line of type comes in contact with the paper as it passes over a rubber cylinder or platen, thus producing an entire facsimile typewritten letter with each revolution. A signature device signs each letter as it is printed. After the letters have been



Figure 154: With a printing ink attachment a machine which reproduces copies from typewriter type can do office printing. The type is set either on the typesetting unit or by hand from printers' type milled to fit the channels of the printing drum. Electrotypes and stereotypes, unmounted and curved to fit the surface of the drum, may also be employed. See pages 392 and 393 for added information.

run through, the name and address are filled in on a correspondence typewriter, using ribbons that match in color the shade of the ribbon used on the duplicator.

For long runs there are large power models, and for the smaller user models built to handle less volume. Some models are equipped with an automatic feeding device. A

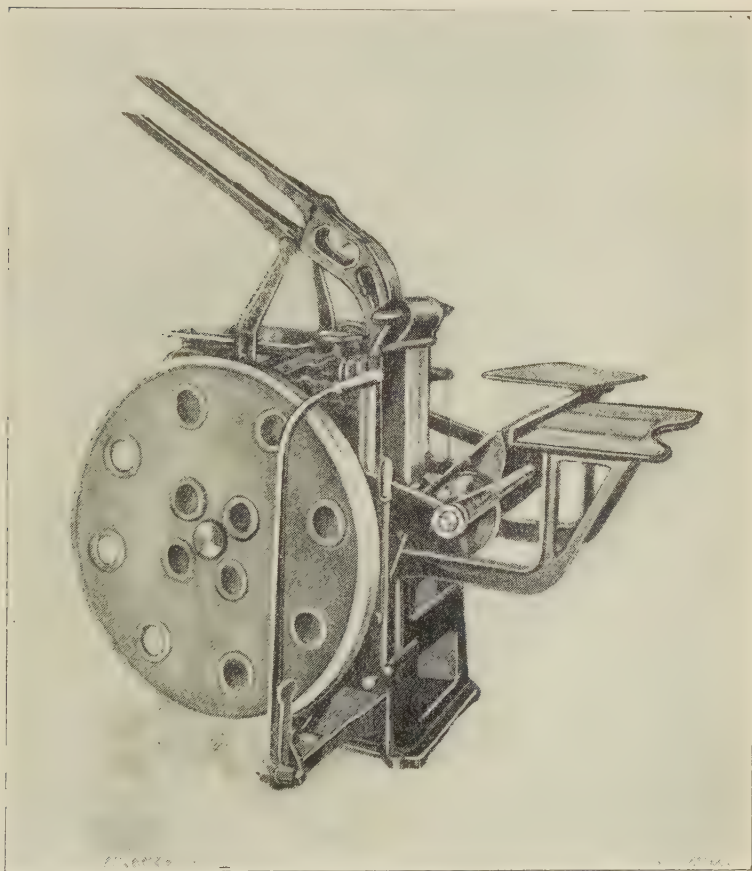


Figure 155: With the duplicating machine above it is possible to reproduce a letter and fill in the name and address at the same operation. How the individual typewriter plates (one for each name on the mailing list) change with every impression made, is described on page 392.

speed of 2,400 to 4,800 impressions an hour is obtainable with the large power-driven equipment.

Printers' type printing is accomplished on this class of machine by a printing ink attachment. The type is either set semi-automatically on the typesetter previously described, or by hand composition from regular printers' type, milled to fit the channels of the printing drum, or if different sizes or faces of type cuts, ornaments, or borders are used, electrotypes or stereotypes, unmounted and curved to fit the face of the printing drum, may be employed (see Figure 154).

Another machine which prints from typewriter type is really a printing press, as may be seen from Figure 155. It produces letters with the name, address, and salutation from typewriter type cast on the linotype machine, and the type

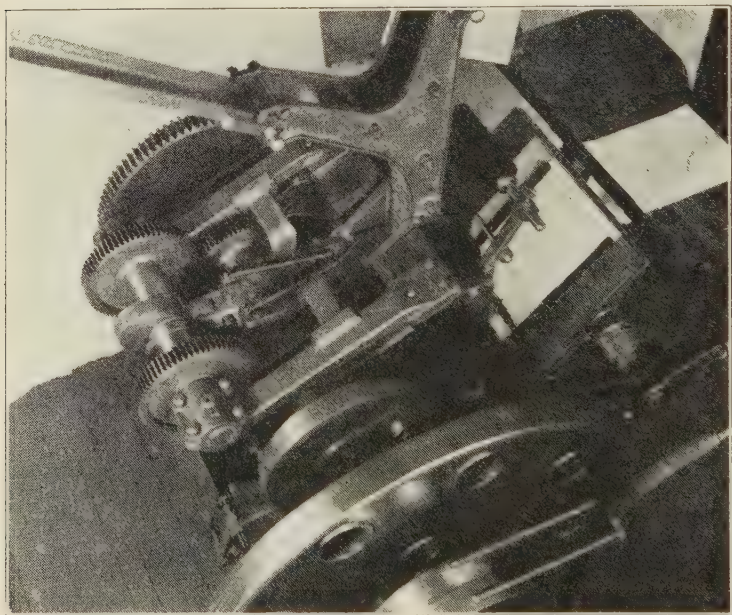


Figure 156: This illustration shows how the name and address slugs are fed into the machine which reproduces and fills in letters at the same time. After the impressions have been made, the slugs are filed ready for the next mailing. For full details, see page 393.

matter for the filling in of the name, address, and salutation is changed automatically at each impression of the press. The type composition for the body of the letter is locked in the press so that it will print through a ribbon each time the individual typewriter plates (one for each name on the mailing list) automatically print. The linotype composition remains in the press, but the linotype slugs for the individual's name change with each impression. The speed of this machine is 1,000 letters an hour and 1,200 envelopes which are addressed from the same linotype slugs.

In Figure 156 note that the name and address slugs are gravity fed into the machine in position to be carried forward and held in printing plane with the balance of the

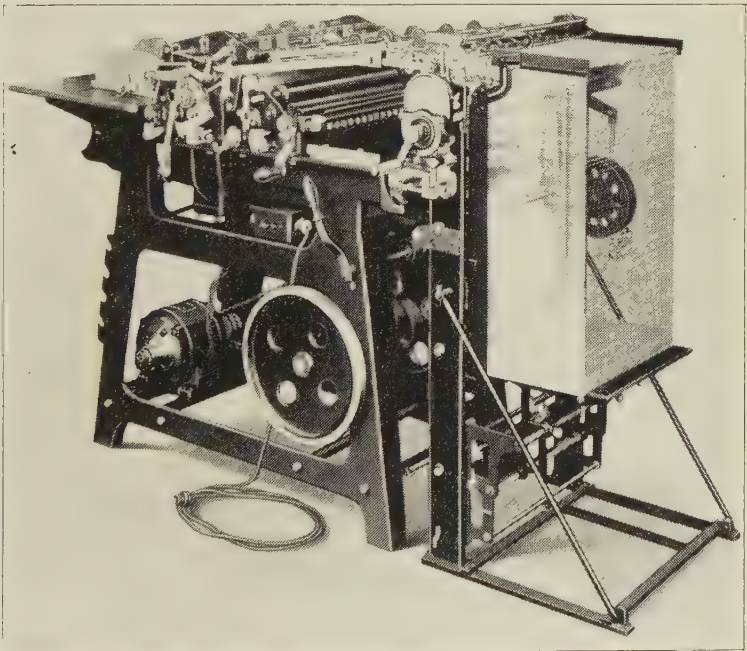


Figure 157: There is a duplicating machine for every need, as you will learn from reading this chapter. This one is designed for the production of house organs, letter-heads, and the like, which print from printers' type. A description of this class of machines is given on page 394.

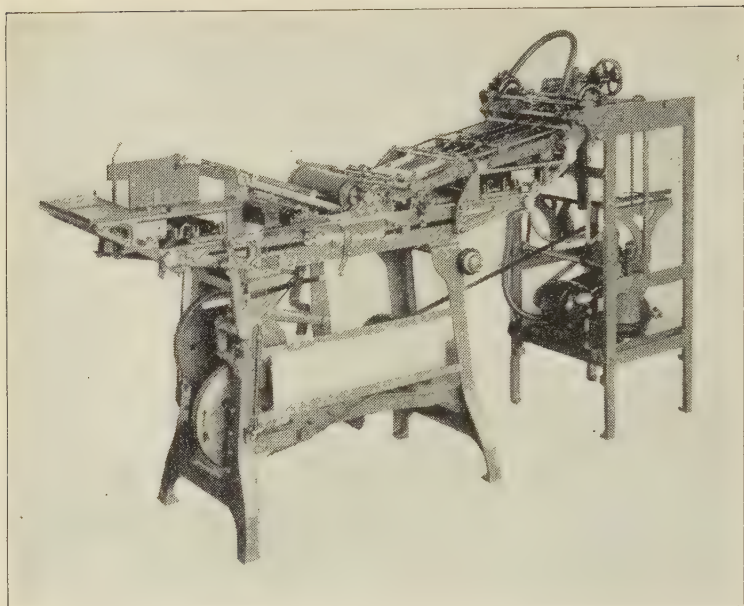


Figure 158: Every medium for convincing prospects by mail can be made by some type of duplicating machine. That's only one way in which such devices are serving thousands of concerns. This machine, described on page 395, prints from standard equipment foundry type, linotype, monotype, flat electrotypes, flat zincs, and half-tones.

body of the letter and then automatically ejected into the dead chamber immediately under the press, whence they are removed and placed in permanent files to await a second mailing or the address of envelopes for the same list.

*Machines Which Print from Printers' Type.*¹ Machines of this class are really small printing presses adapted particularly for the production of house organs, four-page illustrated letters, letter-heads, bill-heads, shipping orders, cost sheets, price lists, and so forth.

The press illustrated in Figure 157 is designed on the reciprocating bed and cylinder principle; that is, the type mat-

¹Machines of this class are made by such companies as The American Multigraph Sales Company; the Lisenby Manufacturing Company.

ter—printers' type, electrotypes, or plates—is locked in a chase and prints from a cylinder bed. With a $\frac{1}{2}$ -horse-power motor this machine has a speed of 4,800 impressions an hour.

Another machine, illustrated in Figure 158, is built on the flat-bed principle and prints from standard equipment foundry type, linotype, monotype, flat electrotypes, flat zincs, half-tones. This machine is particularly suited to the production of color work, since it has two ink fountains, permitting the printing of two different colors in one run, and in addition a device for printing through a typewriter ribbon, which permits the printing of a third color in the same run.

AUTOMATIC TYPEWRITERS¹

This class of duplicators is designed to produce actual typewritten letters rapidly.

The machine consists, as seen in Figure 159, of a standard typewriter mounted on and operated by an electric mechanism.

The mechanical movements are controlled by a perforated strip of record paper similar to a player-piano roll. This record is made on a specially designed machine which is part of the equipment (Figure 160). The perforator has a standard typewriter keyboard. The letter to be produced is first written by hand and from this copy the typist cuts the record on the perforator. Each perforation represents a character in the typewriter keyboard and is reproduced by pressing down on the perforator keys. When the cutting of the perforations is completed, the perforated paper is cut off and the ends cemented together to form a roll, which is then placed on the drum, in front of the machine. In the drum are a number of lengthwise slots over which the perforations in the record paper rest. When the machine is

¹Machines of this type are manufactured by such companies as The Hooven Automatic Typewriter Corporation.

started, the drum revolves, carrying forward the record paper, which passes under the pins. As a perforation passes under a pin, the pin drops into a slot in the drum. By means of a mechanical connection this process actuates the typewriter keys as though by hand, and after all the perforations have passed over the drum once, the operator removes the finished letter and repeats.

The machine may be used as any standard typewriter, and at any point the operator may stop the automatic mechanism and typewrite, by hand, information of interest



Figure 159: Pins at the top of the drum of the automatic typewriter drop through perforations in the record paper (illustrated in Figure 160) as it revolves, thus operating the typewriter keys. After all perforations have passed over the drum once, the operator removes the finished letter and repeats until the requisite number of letters have been produced.

only to the recipient of that particular letter. This machine writes at approximately three times the average speed of a typist. One girl may operate as many as four machines at the same time.

THE PLACE OF THE DUPLICATING MACHINE IN BUSINESS

To establish itself as a valuable member of the office appliance family a machine must save time and money and assure accuracy. These three requirements have been met by duplicating machines, which are demonstrating their capabilities in thousands of concerns.

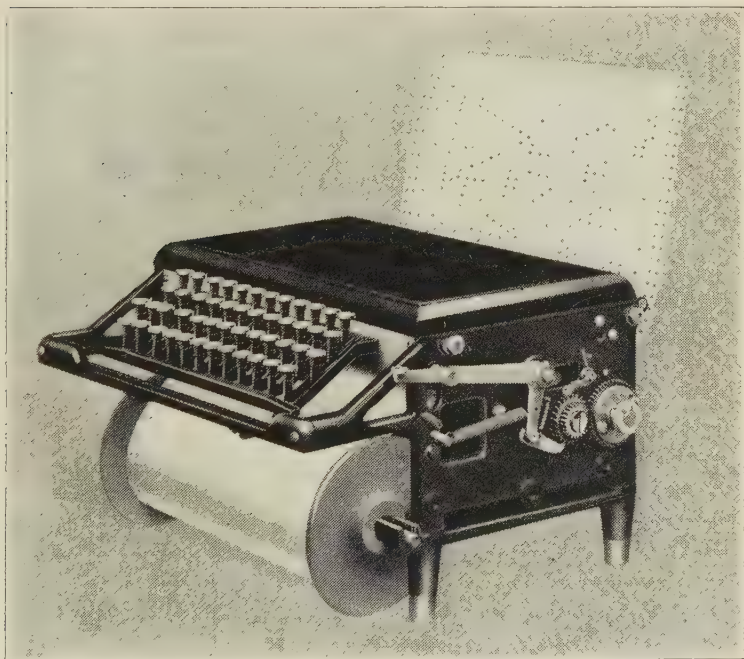


Figure 160: A letter to be reproduced on the machine pictured in Figure 159 is first handwritten, and from that copy a record is cut on the perforator shown here. Each perforation represents a character on the typewriter keyboard. Page 395 tells how this record controls the mechanical movements of the automatic typewriter.

From the description of the several types and the following very brief summary, an idea of the adaptability of this class of equipment can be gained.

First, it may be stated that anything handwritten, typewritten, or drawn can be reproduced on the machines just described. Facsimile and actual typewritten letters, bulletins, reports, notices, ruled forms, examination papers, lectures, price-lists, layouts, menus, statements, cost-sheets, instructions to workmen, production records, factory tags, house organs, illustrated booklets and advertising literature, drawings, sketches, diagrams, charts, maps—this incomplete list must serve to indicate the scope of usefulness.

Some machines have been designed primarily for a particular kind of duplicating. For example, one type of machine produces actual typewritten letters; another fills in letters as they are reproduced.

It is to be expected when there are so many different types of certain kinds of equipment, constructed on varying principles, that some are better fitted for certain work than others—that each has its advantages.

A list of departmental uses long enough to fill several pages might add to the prospective purchaser's conviction that a duplicating machine has a place in his office; but the mere restatement that every department will find work for it to do must suffice.

XXIV

PHOTO-COPYING MACHINES

What photo-copying machines will do. The machine and how it operates. Auxiliary equipment: electric lamps; dryers. Reasons for installing photo-copying apparatus.

WHENEVER an exact copy of anything which is written, typewritten, printed or drawn is needed, the photo-copying machine can be used to the greatest advantage. It makes exact copies of the original by means of a process which is rapid and simple in operation. This means that the photo-copying machine offers a means of saving time and money not only because of its simplicity of operation, but also because of its unfailing photographic accuracy.

There is scarcely a business today that does not have a need for a photo-copying machine. Deeds, contracts, mortgages, maps, drawings, orders, letters, invoices, testimonials of all kinds can be reproduced in exact duplication. Any size original can be reproduced in actual size, enlarged, or reduced within the limits of the size of the machine used.

THE MACHINE AND HOW IT OPERATES¹

The photo-copying machine resembles a large camera (see Figures 161 and 162). It is constructed to photograph direct upon sensitized paper which through a process of developing within the machine becomes the finished print. Directly below the lens of the camera and attached to the framework of the machine is a glass-top copy—or subject-holder. The material to be photographed is placed under the glass. When pages of a book are to be copied, a device

¹For further information on these machines get in touch with such companies as Photostat Corporation and Rectigraph Company.

adjusts the top to the correct height. For special purposes a ground-glass screen may be used. This special screen is used chiefly because of the peculiar shape or nature of the object to be copied. Color screens can be used also in photographing blue, purple, and other colored copies.

As the focusing is automatic, little skill is required on the part of the operator. The developing is automatic also. The sensitized paper is held within the machine in a continuous roll and is fed through the exposing chamber, the developing and "fixing" solutions, and then it is cut off at the desired length.

The finished print is a "negative," that is, the dark portions of the original are reproduced white, and the light portions in the original are reproduced black. In order to make a "white print," the negative or "black print" is re-photographed.

AUXILIARY EQUIPMENT

The lighting and drying are very important parts of the developing process. To facilitate these two operations the electric lamp and dryer are used.

*Electric Lamps.*¹ The best results are obtained when light is of unvarying intensity. Although the photo-copying machine can be operated by daylight, the electric lamp affords a constant light of high photographic power. It gives out light from a glass tube which is filled during the operation with a luminescent vapor. To insure uniform illumination a reflector is directed upon the work to be copied. The tube may be adjusted to any required position.

*Dryers.*² The principle of the so-called apron dryer is a combination of absorption and heat treatment. It is constructed of a continuous fabric strip which is long enough to

¹Lamps are manufactured by such companies as the Cooper-Hewitt Electric Company.

²For further details write such companies as the Pako Corporation.

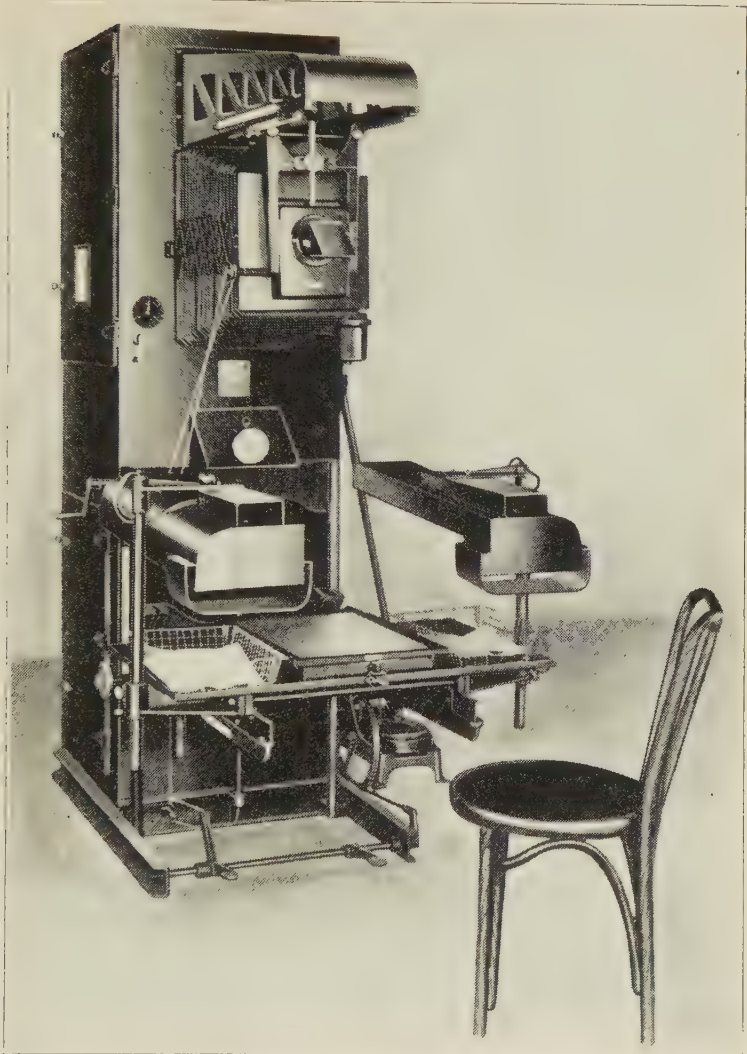


Figure 161: This large camera-like apparatus is a photo-copying machine. Material to be copied is placed in the glass-top cabinet and the focusing is done mechanically. Machines of this type are used to copy blue-prints, pencil drawings, letters, signatures, contracts—in fact, they will handle practically any copy work.

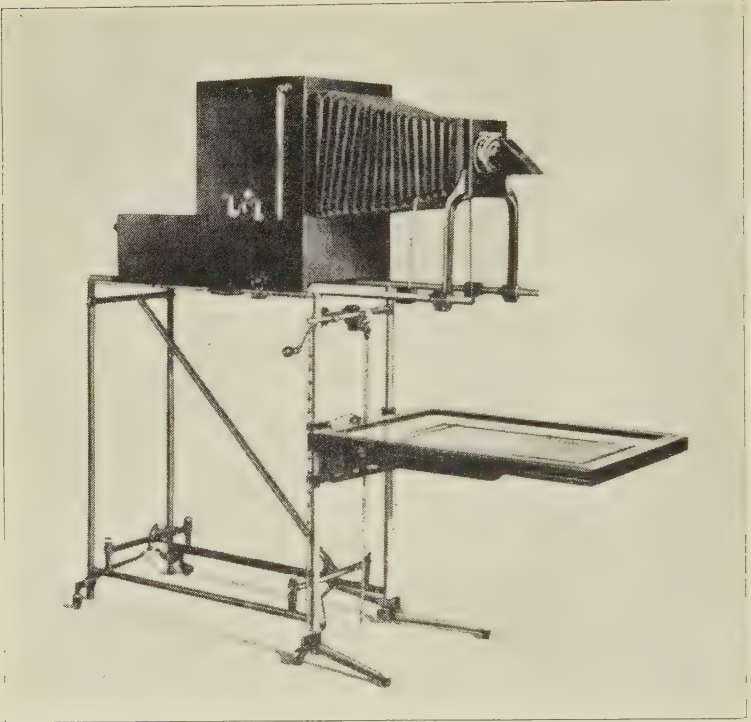


Figure 162: This machine reproduces rapidly and at low cost facsimile copies of anything handwritten, typewritten, printed, or drawn. That is why businesses of all kinds are installing photographic copying machines. Read in this chapter how many kinds of copying work machines of this type can reproduce at a saving.

dry before returning for more prints, and an electric or gas heater. By means of a meter the heat may be regulated. The prints are placed on the apron and with one trip through the machine come out dry. This device greatly speeds up the process of photo-copying.

When the photo-copying machine is thus equipped with an electric lamp and dryer, it assures that the best possible results can be obtained. Such equipment is of inestimable value to businesses where photographs must be reproduced in enlarged or reduced size.

REASONS FOR INSTALLING PHOTO-COPYING APPARATUS

Although the general office finds the photo-copying machine valuable in many phases of its work, there are certain businesses which find the reproducing device indispensable.

Whenever charting and diagraming are carried on extensively, need for the photo-copying machine is great. It is no small wonder, therefore, that architects, builders, real estate dealers, and engineers of all kinds recognize the photo-copying machine as an indispensable part of their equipment. Building plans, maps, surveying diagrams, and all such charts can be reproduced quickly, and, more important, in absolutely accurate duplicates. Another point of interest is the fact that these same charts may be enlarged or reduced to suit individual needs. For instance, a pocket-sized map may be obtained from a large diagram of a city district.

There are literally thousands of uses of the photo-copying machine in legal work. Testimonials of all kinds can be reproduced in a way which affords indisputable evidence.

As another instance, let us consider the insurance companies. Here is a case where several copies must be made of an application for insurance. Then, too, there are the physicians' certificates, physicians' notations, the agent's comments, and whatever other records it is necessary to attach to a given policy. Frequently photo-copies must be made of the entire policy. This in a general way indicates the great savings that the photo-copying machine obtains in insurance business.

Advertising departments can save money too, particularly if the advertising copy features several users of the product advertised. Then copies may be mailed or delivered to each user for his o.k. In this instance the photo-copying machine not only saves money but permits the advertising department to retain the original copy.

The fact of being able to get easily and quickly accurate copies of contracts, endorsement letters, specifications, requi-

sitions and other forms of promotional material is of remarkable value to sales and production departments. It is not necessary to go into any great detail as a means of emphasizing how much a photo-copying machine can save sales departments in sending exact copies of certain material to the salesmen in the field.

The idea of mechanical copying, which first found favor in the drafting rooms of engineers' offices and in the improvement divisions of large manufacturing plants, has now come to a point of being recognized and accepted in every sort and size of commercial endeavor. It is interesting to observe that on certain jobs of reproduction the photo-copying machine is performing the task in place of the printer's press. This is particularly true when but a limited quantity is required or when time is a factor of importance. The development of the photo-copying machine has demonstrated its place in the conduct of modern business. Consequently, its acceptance is general and the ways in which it is used are of many score.

XXV

ADDRESSING MACHINES

Hand addressing wastes time and money. Pioneers in the addressing-machine industry. Attachments common to all types: automatic selector; cut-off; dater; duplicator; automatic ejector; gages; lister; hand spacer; numbering devices; repeater; skipper; signals; tag feeder; triplicator; quadruplicator; automatic envelope feed; mailer strip lister; proofer; town and route marker. How to select the right system. Three methods of printing. Metal plates the basis of three systems: address plates; embossing machines; addressing machines. Fiber stencils the basis of other systems: stencils; how the stencils are cut; addressing machines. Other machines print from type slugs: address slugs; linotype, intertype, or linograph machines; addressing machines. Addressing machines do more than address envelopes: marketing; recording; shipments; collections; disbursements; routing.

EVERY office must copy names and similar data, to a greater or lesser degree. Whatever the job may be, slow and inaccurate pen and typewriter methods not only become wearisome to your employees, but they also waste time and result in confusion and loss. Such methods are becoming more and more obsolete. In every modern office, the addressing machine is replacing the pen and the typewriter. Whether you write only a few names or many names and routine data, there is a size of addressing machine which will accomplish great savings for you and insure better results.

Due to the growth of direct-mail advertising, the regular contact with customers, and similar business activities, the question of addressing has come to be one of the most important functions of office work. The value, to direct-mail advertisers, of following up customers and prospects, alike, with price lists, personalized letters, and so forth, has long since been recognized. But to justify the expense of such advertising, it is essential that all work connected with this

activity be performed as cheaply as possible, consistent with effectiveness.

While addressing machines are, of course, designed primarily for writing addresses, the term "addressing" is misleading to a certain extent, in that it suggests a limit to the utility of these machines which, as a matter of fact, does not exist. Addressing envelopes or wrappers is by no means the only important use to which these machines may be put. They handle a wide scope of office work, as the following data demonstrate.

PIONEERS IN THE ADDRESSING-MACHINE INDUSTRY

But before going into this phase of the subject too deeply, it seems pertinent to outline the historical development of addressing machines. The first record of such a machine takes us back to 1870. To be exact, a patent was issued to James McFatrigh, of Lens, Illinois, on October 4, 1870, for a machine called the "McFatrigh Mailer" which was, so far as is known, the first addressing machine. Securing a license from the inventor, the Shniedewend & Lee Company, of Chicago, manufactured the mailer during the full term of the patent, beginning in 1880.¹ The original machine was adapted for use in newspaper offices only. Later it was improved so as to be useful in mercantile, manufacturing, and other concerns.

McFatrigh was not alone in this pioneering, for in 1877 Frank D. Belknap,² of Wooster, Ohio, made an attempt to get away from hand addressing. As a publishers' representative he was confronted each month with the arduous task of addressing large numbers of magazines. The plan which he devised was known as the electric pen method. He wrote the names and addresses on a sheet of parchment paper with

¹This company was succeeded by The Challenge Machinery Company in 1893. The name was changed to the Mercantile Addressing Machine Company.

²Mr. Belknap perfected his model and in 1885 founded the Rapid Addressing Machine Company.

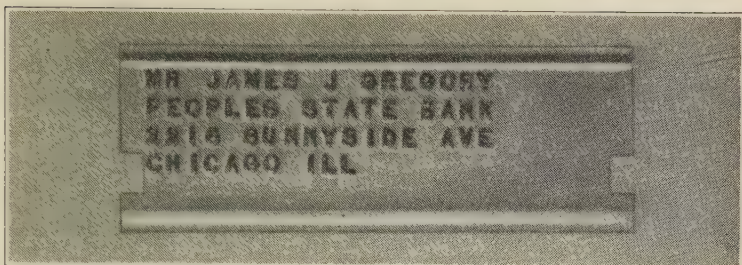


Figure 163: Some addressing systems make impressions from metal plates embossed with the name, address, and other data by means of a machine especially designed for the purpose. Two other styles are shown in illustrations A and B of Figure 164. All are described on page 422.

an electrically operated pen and obtained additional addresses by passing an inked roller over several sheets of parchment containing the master addresses, the envelope or matter to be addressed being placed under the sheet.

When the typewriter came into commercial use, parchment paper, instead of being used in long strips as in the earlier models, was cut into individual pieces and pasted to a cardboard frame, thus making the first addressing machine stencil. These stencils were inserted into the typewriter, one at a time, and the name and address cut into the paper by the needle-point type with which the early stencil-cutting typewriters were equipped. The stencils were then fed through the addressing machine and the envelope addressed, the outline of the letters being dotted.

In 1890, another inventor, Walter E. Crane,¹ brought out a keyboard machine which embossed names and addresses on paper and metal. Thin brass was used for the handling and correcting of certain lists. The thin brass was in continuous long strips, and to make removals and additions it was necessary to cut the long strips and solder them together to maintain proper assortment. Special machines were developed and built to cut the brass and solder the

¹Fred H. Alling later bought out all Mr. Crane's interest and with several other men founded the Pollard-Alling Company in 1899.

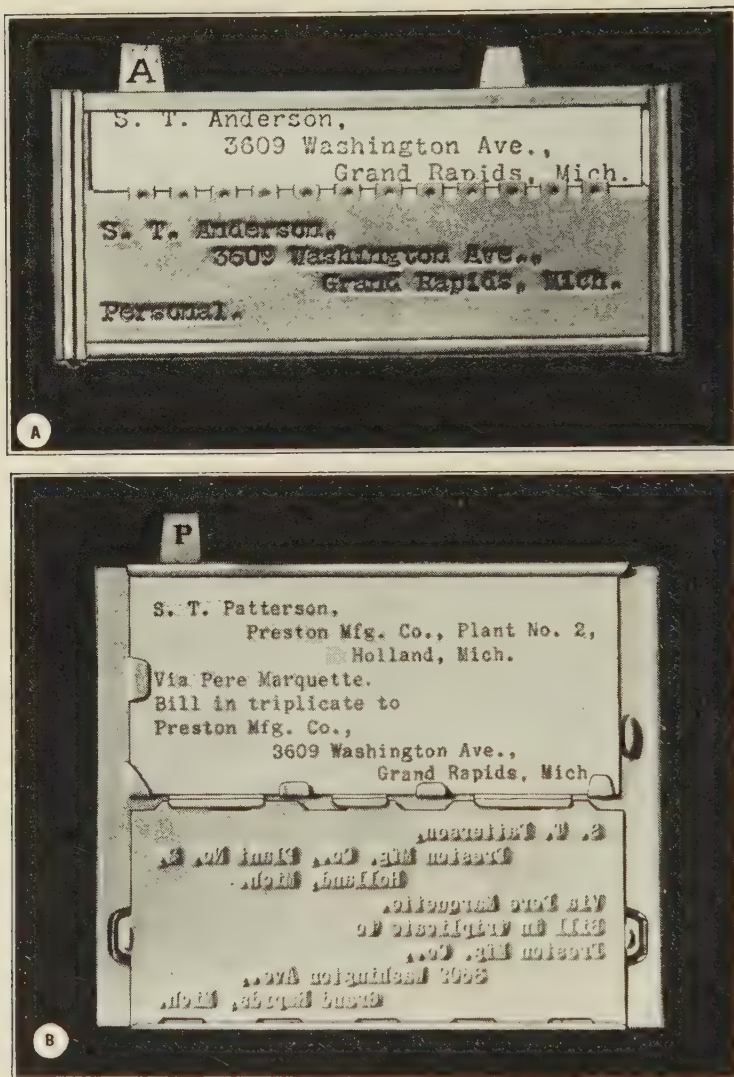


Figure 164: Illustration A shows a type of plate with name card attached. Illustration B shows a large record card with spaces for entering data relevant to the name on the plate, which decreases the number of files necessary. The plates and the method of stamping the characters into the metal are described on pages 422 and 423.



Figure 165: This girl is putting in new plates and taking out dead names from a reel of linked, aluminum address plates used with such machines as the one pictured in A of Figure 172. After the plates have passed the reading point, they are automatically rewound on another reel. See page 427.

ends together. To print the addresses, the continuous strips of brass were run over a drum on high-speed addressing machines, winding automatically from one reel to another as the addresses were printed. Later, individually hinged address plates of thin aluminum were substituted for the brass strips.

Another pioneer in the field was Joseph S. Duncan,¹ who was also dissatisfied with the drudgery of addressing the same list at frequent intervals.

As secretary of a Sioux City, Iowa, grain firm, one of his many duties was to address a hundred or two quotation

¹Mr. Duncan founded the Addressograph Company in 1893.

cards to farmers every day. The task, though necessary, so cut into his other work and grew so tedious that his inventive genius was aroused.

On a large metal drum which revolved on an axis, he glued some rubber-stamp addresses which passed under a self-inking stamper arm. Pressure on the cards or envelopes by the stamper arm against an address on the drum produced an address on the card, the drum being so arranged as to advance automatically for the impression of the next address. That was the original of the Addressograph. Soon, rubber type was discarded in favor of the more economical and speedy metal address plates which are so quickly embossed with exact typewriter style type.

In 1897 Sterling Elliott devised an addressing system of his own to address wrappers and prevent delays in mailing the official organ of the League of American Wheelmen, of which he was president. His machine embodied principles of construction and operation not found in the others. It was designed primarily for his private use, and was not marketed until 1900.¹ In 1907 the cardboard frame was adopted to replace the metal frame formerly used.

In 1901 Sanford C. Cox,² of Rock Rapids, Iowa, made application for a patent on a machine for addressing newspapers, which had been developed in connection with the subscription mail circulation of a daily paper. The new device automatically imprinted from slugs directly on the margin of the newspaper and was soon elaborated to cut a narrow wrapper from a roll, fold and seal the newspaper in it, and separate the list for towns and routes, all at a high rate of speed. This line of machinery has been extended since and simplified. Later, embossed metal mats for lino-type slugs were substituted.

To these six pioneers belongs the credit for the successful development of the initial addressing machines. Since

¹Mr. Elliott founded the Elliott Addressing Machine Company in that year.

²Cox's original company became The Speedautomatic Company in 1919.

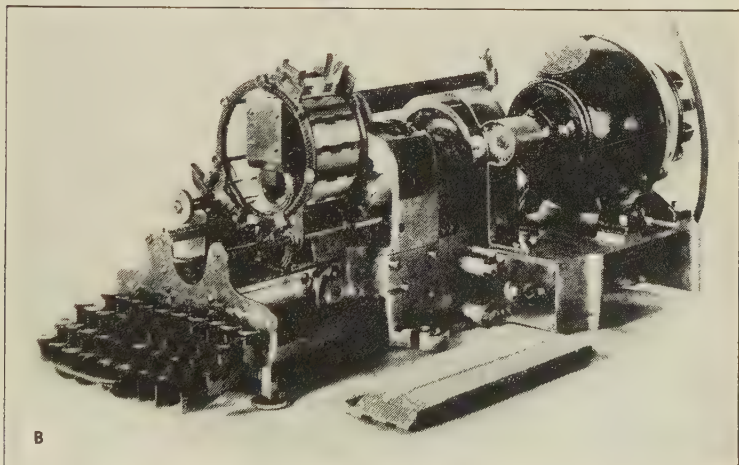


Figure 166: Here are shown two types of metal-plate embossing machines. Illustration A shows a motor-operated model without keyboard. A correction of address may be made by this machine by writing over the original. Illustration B shows a motor-operated keyboard model, on which addresses are written in much the same manner as on a typewriter.

the first models were put on the market, there have naturally been many improvements and many additions in the way of special attachments. Although the machines now manufactured in some cases carry distinctive features, nevertheless all have as their essential basis the principles of one or another of the original machines.

ATTACHMENTS COMMON TO ALL TYPES

Before classifying addressing machines, it seems advisable to take up and treat briefly the several important attachments which are so common as to be thought of as standard equipment. The form these attachments take is dependent upon the type of machine selected.

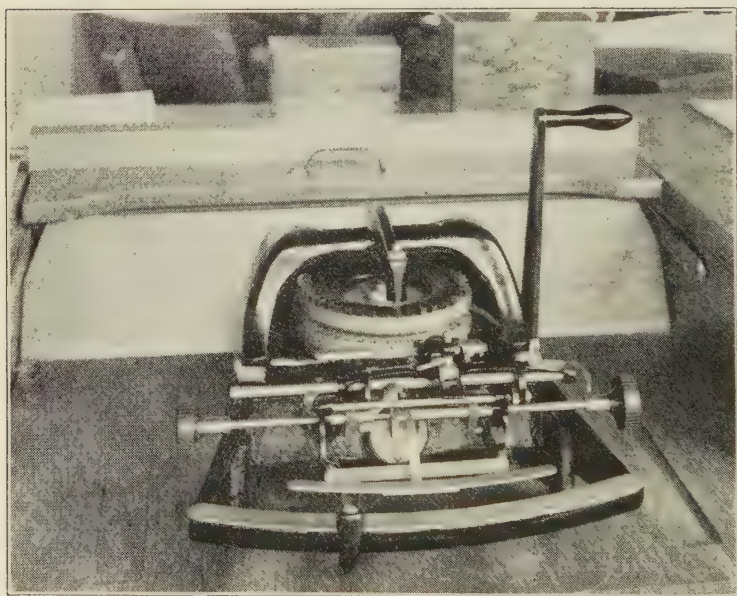


Figure 167: Metal address plates are embossed by means of a hand- or motor-operated machine. The desired characters are selected by an indicator and a pull on the handle causes them to be stamped into the metal. Corrections in addresses may be made by writing over the original. For added details, see page 423.

It is not the purpose of this book to recommend any special system or type of equipment. Rather, its aim is to call to the reader's attention the several types of equipment and systems, in an authoritative and unprejudiced manner, so that he will be able to form his own conclusions regarding the exact type of equipment best suited to his needs.

In line with this purpose, special attachments will first be taken up; second, the main points on which a decision should be based will be pointed out; third, a classification of addressing-machine equipment will be stated, followed by adequate descriptions and operating details for each type; and finally, the chapter will be concluded with a section on application.

A number of special attachments deserve mention here. These are: Automatic selector; cut-off; dater; duplicator; automatic ejector; gage; lister; numbering attachment; repeater; skipper; signal; spacer; tag feeder; triplicator; quadruplicator; multiplier; automatic envelope feed; mailer strip lister; proofer; and town and route marker.

Automatic Selector. A machine equipped with this device can be made to skip the printing of certain plates or stencils automatically as they are fed through. Suppose that the operator wishes to print only the names of people who are interested in certain kinds of merchandise, who are located in certain territories, whose accounts are due, who have quit buying, who are engaged in certain lines of business, or who fall into any other special classification. Using a machine equipped to make automatic selections, the operator feeds the entire central or general list into the machine, but only the desired names are printed. After the stencils or plates have gone through the machine, they are automatically refiled in their original order. The automatic selector thus makes it possible to divide a list into many classifications and still keep it in one central file. It saves time and labor and filing space, avoids duplication of address

plates or stencils, and prevents errors and confusion. The operation of the selecting device is governed by removable vertical filing tabs or boss points in the case of metal address plates and by holes or slots in the case of fiber stencils.

Cut-Off. This device makes it possible to non-print certain portions of addresses. For example, a stencil or address plate may contain a customer's name, his address, and a salutation. When this stencil or plate is used to fill in a form



Figure 168: The punches and dies of this embosser are connected with a standard typewriter keyboard so that simply typing the name, address, and other data causes the characters to be embossed in the metal plates. A new expiration date or a new address may be made over the old one.

See page 423.

letter, the name, address, and salutation are all printed. But when an envelope is addressed, the salutation can be automatically "cut off" and only the name and address will print. Another common application of the cut-off is in the heading of pay-roll forms. There are, of course, many other uses.

Dater. Some machines are furnished with an attachment which makes it possible to fill in the date at the same time that the addresses are run. When form letters, statements, invoices, and such matter are handled by the addressing machines, the dater attachment is invaluable.

Duplicator. This attachment, furnished on certain machines, causes the address plate to be held in printing position for two impressions. It is used for heading statements and addressing envelopes to each customer, printing back and front of time-cards, and addressing public utility bills,

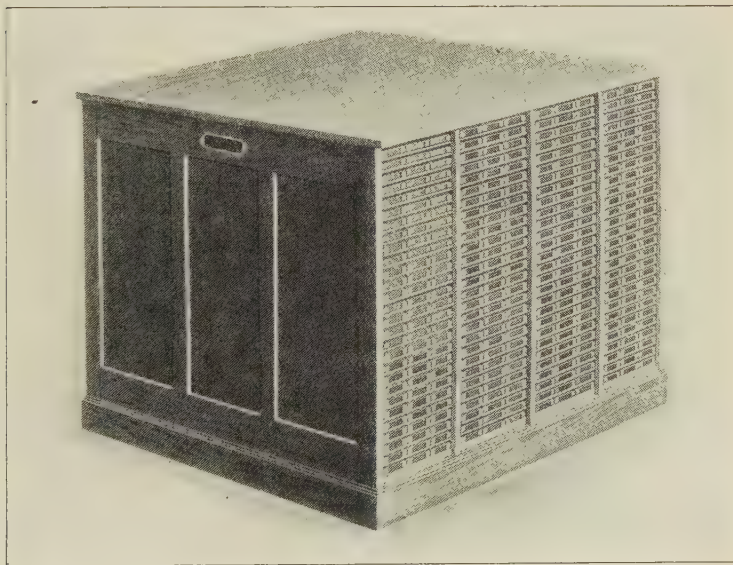


Figure 160: When a mailing list is set in type or linotype, all the addresses are placed in specially constructed galley in geographical, alphabetical, or any other arrangement. The galley are stored in cabinets like this one. These cabinets are made in three sizes.

premium notices and receipts, rental notices and receipts, and so forth, in duplicate.

Automatic Ejector. This ejector is found on some small hand models. After a form is printed the automatic ejector removes it from the printing point, throwing it into a box at the side of the machine. This device adds considerable speed to the hand models for straight addressing.

Gages. These are furnished to locate accurately impressions in any position on any kind or size of form.

Lister. This attachment is constructed to list names, addresses, or other data on proof, blank, and printed sheets, loose-leaf forms, checks, tags, and labels, automatically feeding the forms and automatically spacing the proper distance after each printing. A speedy and accurate method

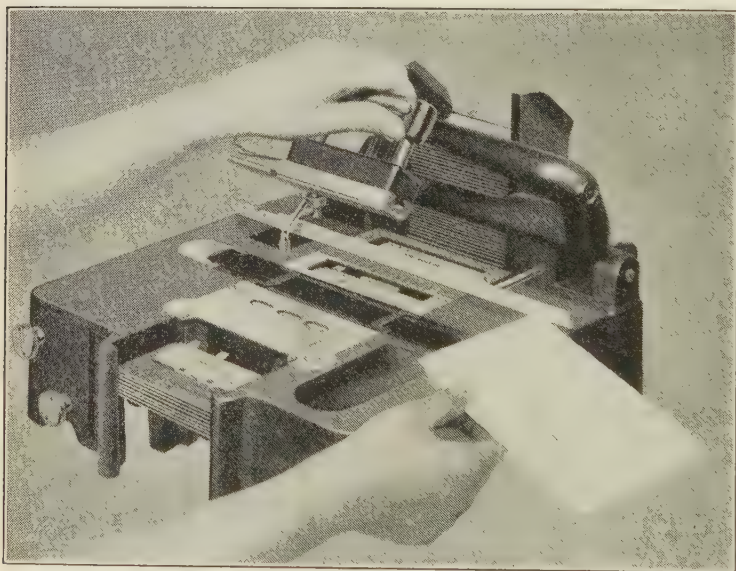


Figure 170: Whatever the kind of business you are in, you will find there is an addressing machine to serve your purpose effectually. With a hand-operated model such as this one, you can address from 1,000 to 1,500 envelopes in one hour. Its operation is described on page 423.

for writing fraud-proof pay, dividend, or other checks is provided by the lister, which feeds the checks in strips or gangs and lists the name, amount, date, serial number, dividend number, and so forth, in one or two colors.

Hand Spacer. By means of the hand spacer it is possible to leave one or more blank lines at will so that data may be later written or typed between the addressing-machine impressions. Listers for sheets can be equipped with a device for speedily changing the spacing of the listing from $\frac{1}{4}$ to $\frac{3}{8}$ or $\frac{1}{2}$ inch, and so on. This is desirable when listing sheets have different vertical spacings.

Numbering Devices. On some machines a number attachment prints either consecutively, in duplicate, or in triplicate from 1 to 999,999.

Repeater. The repeat attachment, provided on several models, prints any number of impressions from the same plate or stencil. Some machines are provided with a hand repeating device, others with a foot lever that permits the repeating of any plate or stencil at the will of the operator, while skipping or consecutively addressing the remaining ones. There are many other uses for this device, such as printing the return address in the upper left-hand corner of envelopes, printing addresses on cards and catalogs, printing postscripts or brief messages on letters, post-cards, announcements, orders, cards, tags, and so forth, at the rate of 1,000 to 7,500 an hour.

Skipper. By means of this attachment it is possible to skip any addresses which are not to be printed. All plates, or stencils after printing or skipping, are automatically refiled in original order.

Signals. Some machines can be equipped with a signaling device to inform the operator when the printing of certain groups of names has been completed. It may be desirable, for example, that the operator be informed when all the names in one department have been printed on the pay-

roll sheet, so that space can be left between the groups of names in different departments. (There is a hand-spacer attachment by means of which the operator may leave any number of blank lines on a sheet without removing it from the machine.) Or it may be desired to use different forms for different groups of names. Here again the signaling device is useful. On some machines the operator is signaled by the ringing of a bell. On other machines the signal consists of the automatic disengagement of the operating lever.

Tag Feeder. A special attachment can be provided for certain hand- and motor-driven machines, by means of which tags can be filled in very rapidly.

Triplicator. This attachment, to be had for some machines, makes three impressions from each address plate or stencil. It is used, for instance, in addressing insurance collection notices, public service bills, and rental notices, in triplicate.

Quadruplicator. The quadruplicator is used for printing four impressions from each address plate.

Automatic Envelope Feed. From 5,000 to 15,000 envelopes can be handled in an hour with the automatic envelope feed and stacker with which certain models may be equipped.

Mailer Strip Lister. This attachment for the larger machines automatically feeds and addresses a narrow paper strip from a roll; this roll is later inserted in a mailer machine which cuts and pastes the addresses on publications.

Proofer. On some large machines, this attachment, which works in conjunction with the mailer strip lister, lists names and addresses on proof sheets used for checking purposes. These proofs generally contain 20 imprinted addresses and may be bound for permanent record if desired.

Town and Route Marker. On some machines there are devices for automatically marking separations in the list between its subdivisions, such as town and mail routes.

HOW TO SELECT THE RIGHT SYSTEM

In the selection of any machine for office work, primary consideration must always be given to certain general characteristics of the machines being investigated which determine their application and value for the performance of the required work. Each type of addressing machine has certain distinctive features and, so that the reader may weigh the pros and cons, for the purpose of determining which is the best type of equipment for his particular use, we shall now outline the more general characteristics which the prospective user should consider in making a selection.

The many different types and capacities of addressing-machine equipment manufactured, afford a wide selection for the prospective purchaser. As in the selection of other office machinery, he must consider such points as durability, ease of operation, application to the work, service rendered by the manufacturer, and the cost. Addressing-machine manufacturers do not simply sell addressing machines; they offer a system of keeping an accurate and classified list, together with pertinent data, and of speedy, accurate, and economical utilization of that list in various ways.

In selecting a system, the prospective owner must consider the durability of the addressing method and the machine itself. He should be assured that continued use will not destroy the efficiency of any part of the equipment. The kind of work that is to be done, of course, has something to do with durability. A type of machine that would stand up under certain kinds of addressing work might not be found so durable for other kinds of work. Therefore, the man who is contemplating the addition of an addressing machine to his office equipment must consider durability in the light of his particular addressing problems.

Another point of consideration is the ease with which the system can be adapted. All possible uses for the machine and the ease and economy of maintaining the list should be investigated. The ease of adapting the machine to individ-

ual needs, its flexibility and scope of utility, determine, of course, the efficiency of the operation of the system.

A very important consideration is the labor cost of the clerical operations in handling the list. This is usually as large—if not larger—an item of expense as the mechanical work of either producing the list or reproducing from it.

The most vital requirement of an addressing system is that it fit perfectly the needs of the particular business of which it is to be a part. Some study should be put on your individual needs before selecting your addressing-machine equipment. There are machines for every sort of addressing work. Some are suited to one particular kind of addressing; others, more versatile, can accomplish a greater number of different tasks efficiently. Again, some models fit into one business better than into others. If you have but one kind of addressing to do, the practical purchase, obviously, is a machine designed especially for that kind of work. Addressing-machine manufacturers will consult with you and make a survey of your requirements, thus aiding you in getting the system that takes care of your addressing problems in the most efficient manner.

Branch offices and agencies are maintained by many manufacturers in all parts of the world. They are not merely selling agencies, but service centers with a complete stock of machines, parts, and accessories, as well as quick facilities for compiling and stenciling or embossing mailing lists for customers who do not care to do this work in their own offices. Skilled men are ready to help the customer or prospective buyer. This point of service should not be overlooked by the man who contemplates the purchase of addressing equipment.

“How much will it cost me?” is one of the first questions a man asks about a commodity that is offered him. In the case of addressing equipment it depends entirely on the particular requirements of his business. The number of names on the list, the length of the rush period, and the maximum number of additions, changes, and kills in a

month determine to some degree the cost of the equipment which he can most profitably use. If your list is small, it goes without saying that the cost of installing a system will be small; for the larger lists, and in cases where several addressing needs must be filled, the initial expenditure will, of course, be slightly greater.

THREE METHODS OF PRINTING

For the purpose of easy handling, addressing machines may be classified as follows: first, those which print from metal address plates; second, those which print through fiber stencils; and third, those which print from galley type or linotype slugs.

The machines which use metal address plates are of three kinds: ribbon-print, ribbon offset print, and ink-print. Those which print from fiber stencils use paste or liquid ink only.

Metal address plates are embossed with the name, address, and other data by a hand or electric type embosser. Fiber address plates are made on a typewriter or with a stylus.

Address plates or stencils serve as card indexes and are filed in trays kept in cabinets. The plates or stencils are fed either by hand or automatically from a magazine to the printing point of the addressing machine and leave an impression on the envelope, card, or other matter which has been placed there by hand, or automatically.

For small lists, hand-operated models are adequate; for larger lists there are foot-lever and electrically operated models. Large, automatic feed wrapper machines are designed for addressing newspapers and magazines.

METAL PLATES THE BASIS OF THREE SYSTEMS¹

The systems which utilize metal address plates for the

¹This type of equipment is manufactured by such companies as the Addressograph Company; Pollard-Alling Manufacturing Company; and Speedautomatic Company.

printing process consist of four distinct pieces of equipment: the metal plates, the machines which emboss the required data on the plates, the addressing machine itself, and the trays, drawers, or reels in which the plates are filed and storage units for housing them.

Address Plates. Metal address plates are made of pure zinc, zinc alloy, or aluminum. Several styles available are shown in Figures 163, 164, and 165. Figure 163 shows the readable side of a zinc mat. Two types of plates with name cards attached are shown in Figure 164. Note in illustration B the large record card for entering data relevant to the name on the plate. Linked metal plates, used with another system, are wound on a reel as seen in Figure 165.

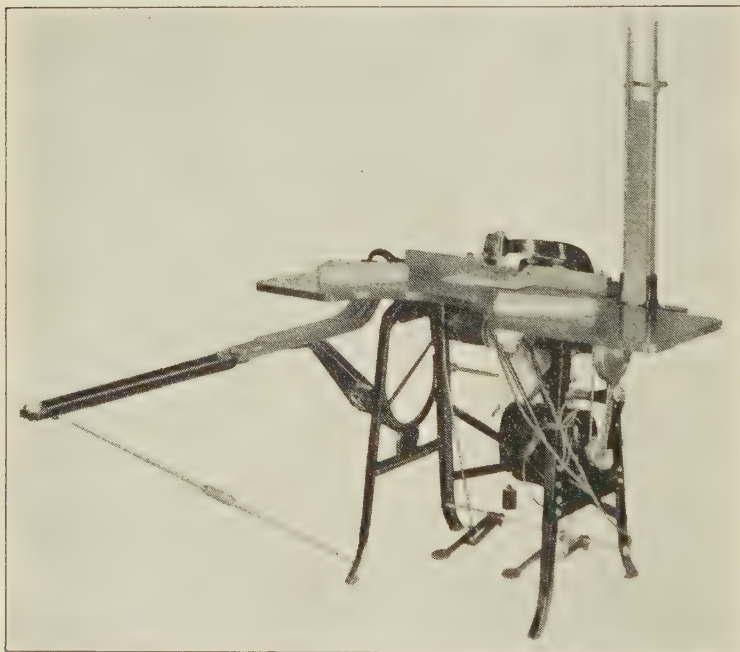


Figure 171: This motor-operated automatic feed machine addresses envelopes catalogs, newspapers, magazines, and so forth, with strip listers and repeat print attachment.

Embossing Machines. The machine which embosses the name, address, and other data on the plate consists of a complete set of punches and dies comprising the alphabet, numerals, and characters of punctuation. Construction of the rest of the machine varies according to the manufacturer.

After a blank plate has been inserted, in some models (hand- or motor-operated) the characters desired are selected by an indicator and a pull on an operating handle causes that character to be stamped into the metal. Figure 167 pictures an embosser of this kind.

Other embossing machines have standard typewriter keyboards, and pressure on the proper keys automatically embosses the name and address. Such an embosser is pictured in Figure 168. In all cases, corrections and changes can be made by reembossing new characters over the old ones. With hand-driven models an operator can emboss 30 to 50 plates an hour; the speed of motor-driven models varies with different machines. Embossing is done in typewriter-style type or linotype style.

Addressing Machines. There are hand-operated machines, foot-lever, and electric-drive models, and, for the large user, high-speed automatic feed models.

For small lists the hand-operated addressing machine is used (Figure 170). A handful of address plates is placed in the rear magazine, and the envelope or form to be addressed placed at the printing point underneath the handle. The plates automatically pass from the rear magazine to the printing point at each operation of the handle, and drop into the front magazine. Duplicating and repeating attachments permit the printing of two or more impressions from the same plate. A multiple platen can be furnished for eliminating the printing of lines or parts of lines of type on the plates. A dating attachment prints the date to the left or right of the name on letters, statements, and above the employee's name on pay forms, and the like. A lister attachment automatically feeds sheets and lists names and other

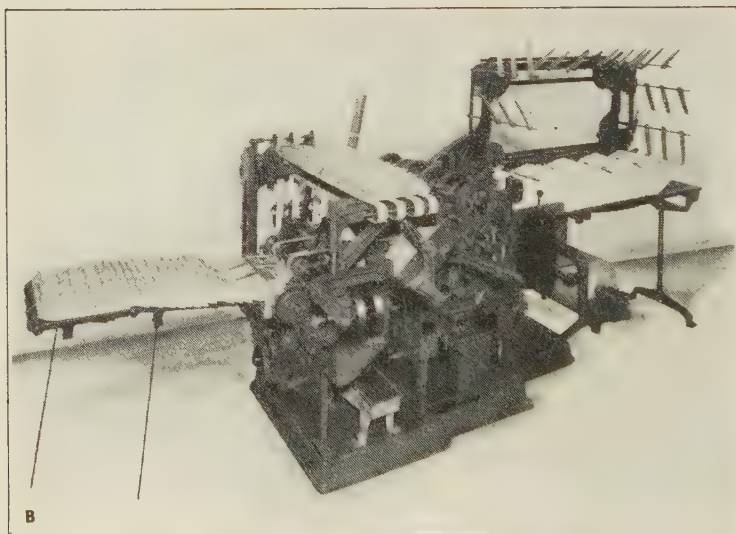
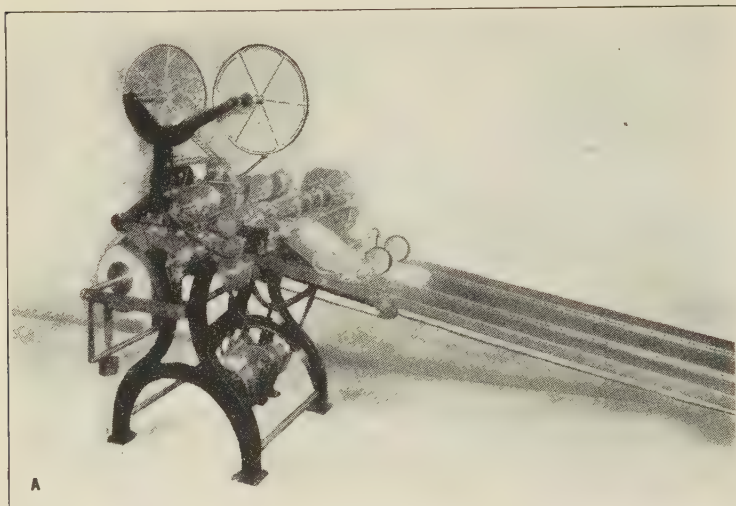


Figure 172: Speed and accuracy in publication addressing are gained by high-powered automatic addressers. The model shown in illustration A prints wrappers cut from roll stock and prints a mailer strip or office proof. Besides addressing, the other model (illustration B) marks publications for town and route or post-office separation, and may, at the user's option, cut wrappers, then fold and seal the papers in them.

information in desired columns. From 1,000 to 1,500 impressions may be made in an hour with this type of machine.

Foot-lever and motor-driven models print through a ribbon, by offset from a ribbon, or from inked plates. Some are characterized by a tall magazine into which a tray or filing

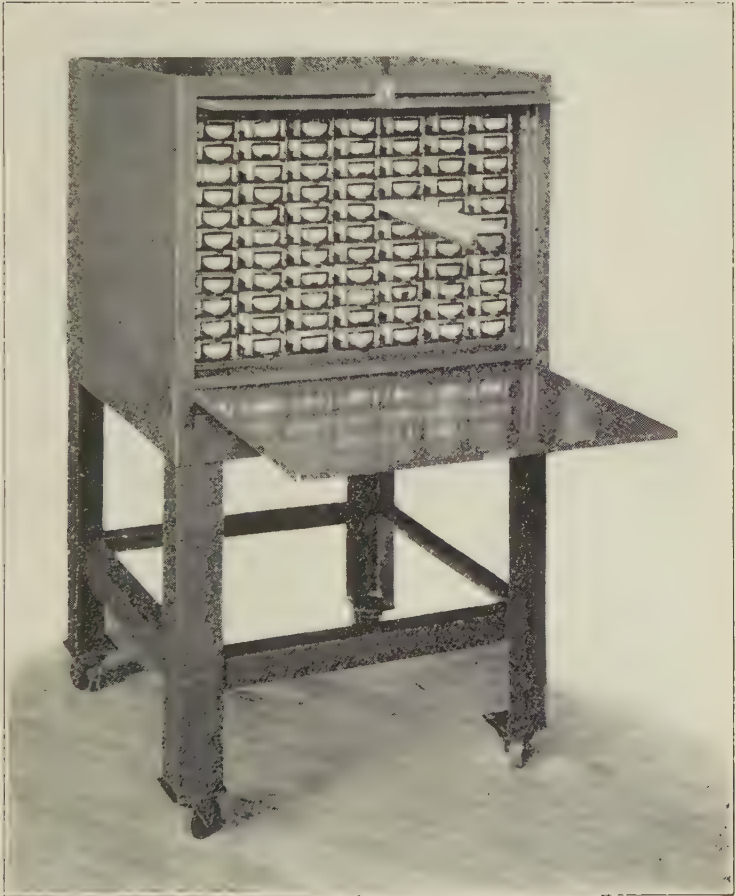


Figure 173: By installing an addressing machine, you acquire not merely a device for printing names and addresses on envelopes, but an entire system which will increase your profits. The address plates and stencils filed away in cabinets like this one become an index to prospects or subscribers. In this type of cabinet 25,000 addresses can be housed.

drawer of plates is emptied (Figure 183). As in the hand-operated machines, the plates pass from the rear magazine to the printing point where the matter to be addressed is placed under the printing handle or stamper arm and an impression printed. The plates then refile themselves in the original order in the tray or filing drawer which has been placed under the machine to receive them. The speed of these machines varies from 2,000 for foot-lever to 12,000 an hour for motor-driven models equipped with automatic feed.

Attachments described on pages 413 to 418 increase the scope and adaptability of these machines.

For extremely large lists there are large, very fast machines equipped with automatic feeds. Figure 172 shows two

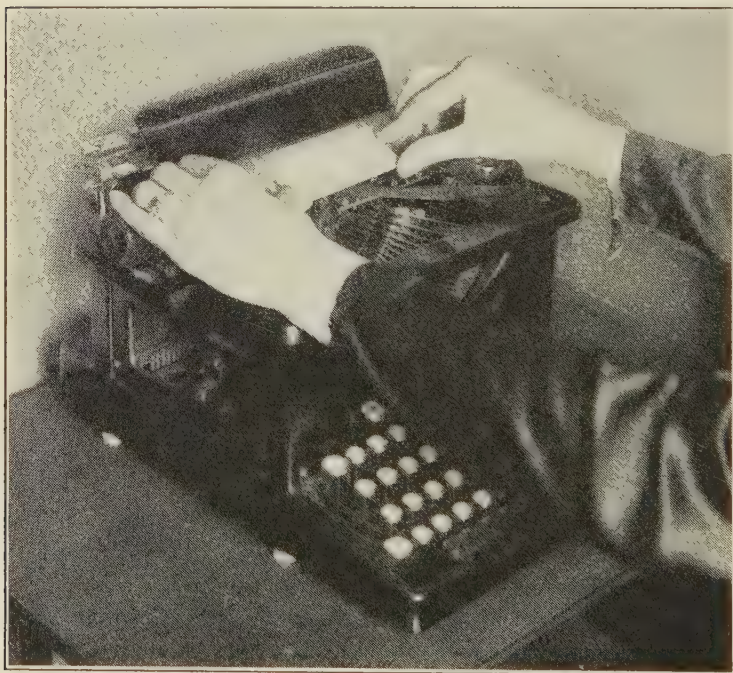


Figure 174: Stencils may be cut on a typewriter equipped with a special attachment for the purpose. This illustration shows how stencils are made.

such machines designed primarily for the publisher to address envelopes, mailer strips, publication wrappers, proof sheets, and to print addresses directly on the margins of newspapers and magazines.

The machine designed for printing mailer strips—that is, narrow strips of names and addresses which are later inserted in a mailer machine which cuts the individual addresses and pastes them on publications—feeds a paper strip from a roll and addresses work at a speed varying from 5,000 to 30,000 an hour. Some models print and cut proofs in convenient lengths. One machine designed for such work (illustration A of Figure 172) uses reels of plates which are rewound automatically on another reel after they have passed the printing point, instead of being refilled in drawers.

Other machines address and cut wrappers for newspapers and magazines from rolls of paper, the speed depending upon the size of the wrappers. From 6,000 to 12,000 wrappers can be addressed in an hour. For certain models there are attachments which allow a continuous strip to be printed at the same time the wrappers are being addressed, and others which cut sheets bearing 20 to 28 addresses to be bound for permanent office record. Attachments on other models print corner card, postal permit, and postal route changes simultaneously with addressing, and separate “expires” into a special drawer while addressing.

Illustration B of Figure 172 shows a machine for addressing directly on the margins of newspapers and magazines. Besides addressing, these machines mark the publications for town and route or post-office separation. From 10,000 to 12,000 periodicals can be addressed in an hour. From two to four persons are required for operating the model pictured—one jogger, one feeder, and one or two bundlers. With some models, about 10,000 newspapers can be folded to eighths, single wrapped, sealed, and delivered into bags in one hour.

Address plates are, in all but one system, filed in drawers or galleys which in turn are housed in cabinets of wood or

steel (Figure 173). Desk-sized cabinets for the small user may be added as the list grows. Then there are large cabinets for the more extensive lists. As has been explained before, the plates of one system are joined together to form a linked chain which is wound on a reel when not in use.

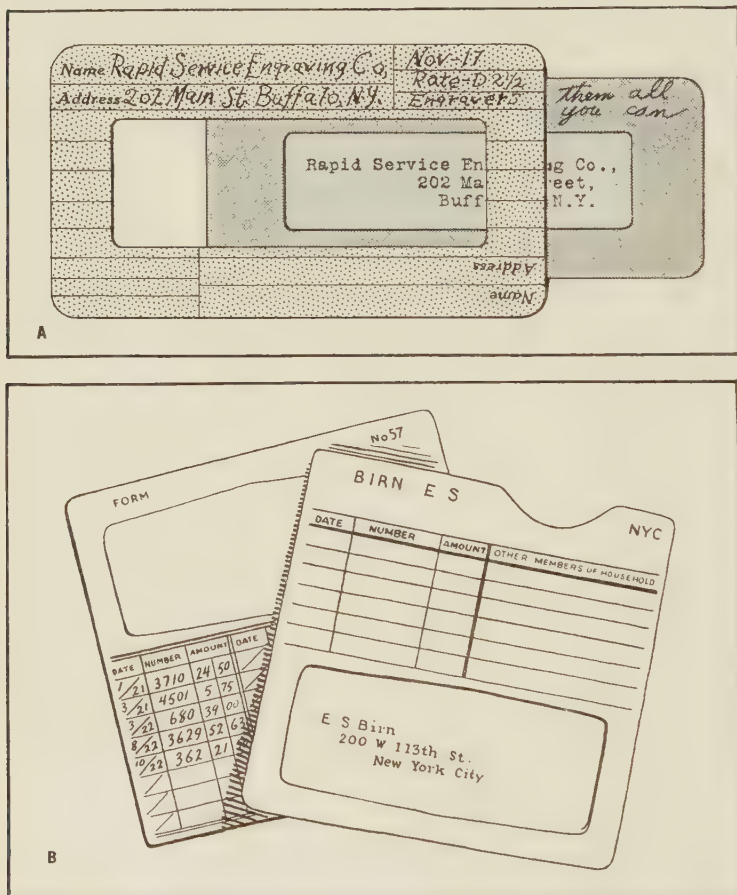


Figure 175: A stencil panel made of fibrous, almost transparent, paper, covered with a gelatinous coating, in which the name and address have been cut with a typewriter, is mounted on a frame in either of the two styles shown above. Space for recording data relevant to the name is provided on the panel shown in illustration B. See page 430.

J P. UNDERWOOD & CO.,
40 WEST EIGHTH ST.,
SAN FRANCISCO, CAL.

AMOUNT MONTH PMNT: 10.00

WHEN DUE: 10th

INSTRUMENT <i>Cheney</i>	STYLE <i>Con</i>	INST. NUMBER 1156
PRICE <u>250.00</u>	EXCHANGE	ALLOWED
DOWN <u>30.9</u>	SALESMAN <i>Bell</i>	CREDIT RATING C3

FORM No. 252

2411 E. 12th St. S.F.
40 WEST EIGHTH ST.
P. UNDERWOOD & CO.

NUMBER	DATE	AM'T.	NUMBER	DATE	AM'T.
9146	1/5 25	10.00			
11321	1/28 25	10.00			
12100	2/25 25	10.00			

LETTERS SENT

1	2	3	4	5	6	7	8	9	10	11	12
☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒

Figure 176: Two stencils showing how complete data are arranged on cards. One card really does the work of two.

FIBER STENCILS THE BASIS OF OTHER SYSTEMS¹

The second type of addressing equipment, according to the outline which we are following, consists of those machines which use fiber address cards. There are three dis-

¹Equipment of this type is manufactured by such companies as the Elliott Addressing Machine Company; Federal Addressing Machine Company; Rapid Addressing Machine Company.

inct items of equipment: first, the fiber stencil cards; second, the addressers; and third, the filing furniture for holding the stencils and housing the trays. For this type of equipment, typewriters with stencil-cutting attachments take the place of embossing machines.

Stencils. Fiber stencils have two parts, the stencil proper, manufactured of a Japanese vegetable fiber paper, and the frame on which it is mounted. The stencil panel is a fibrous, almost transparent paper covered with a special gelatinous coating. Name, address, and other data are stenciled with a typewriter. Figure 174 shows one method of cutting stencils.

There are two kinds of frames, those which carry only the stencil panel (illustration A of Figure 175) and those called record cards, which provide a printed form for recording data, symbols, and classifications concerning the name on the stencil (illustration B of Figure 175). Any variety of form can be printed on the record card; thus all advertising charges, credits, sales, or follow-up records can be kept on the same index card that automatically prints the customer's or prospect's address. The record stencils of one system show all the index data plainly so that the operator can enter new records or change the old ones.

Stencil Cutting. The ribbon is first removed and the stencil-cutting attachment affixed, then the stencil is cut by the typewriter keys. However, instead of printing what is typed, the typewriter cuts the letters in the coating, exposing the fiber through which the ink passes when the stencil is run through the addressing machine. The frame on which the stencil is mounted provides the rigidity and thickness necessary to feed the stencil through the addressing machine in the correct manner. (See Figure 174.)

One manufacturer of machines using fiber stencils provides a stylus pen for reproducing signatures, sketches, rulings, and trade-marks on stencils.

When typewriter type is not necessary for addressing work, another style of stencil-cutting machine may be used. This style of machine, similar in appearance to the embossing machine already described, cuts the address in Gothic type. The hand-operated machine cuts 40 paper stencils an hour; the foot-lever model cuts 50, and the motor model, 60.

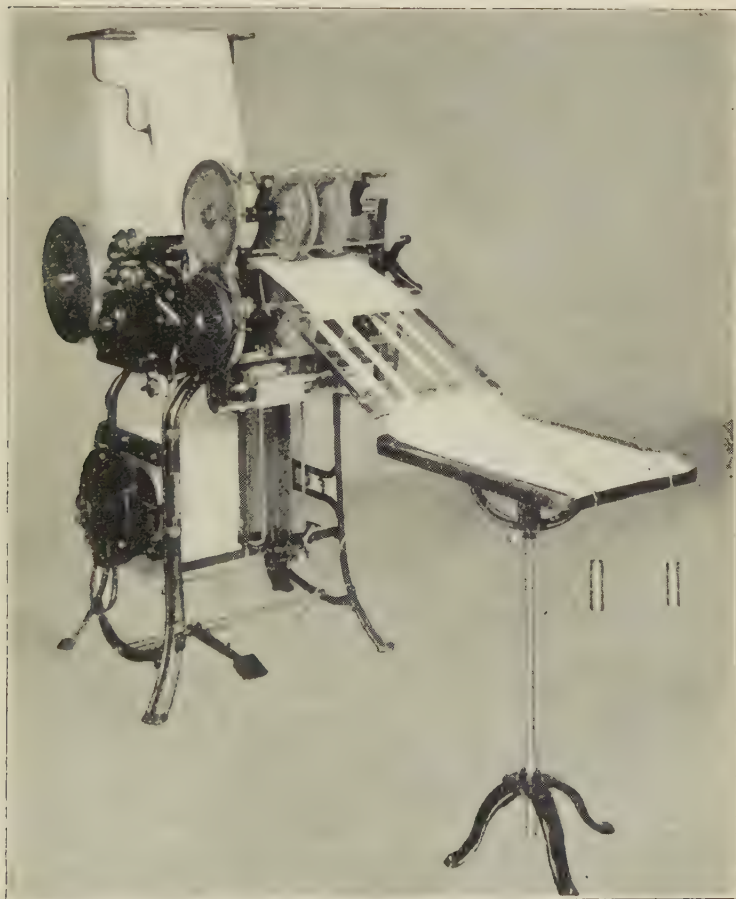


Figure 177: Machines of the type pictured above print wrappers from a roll. Note the roll at the bottom of the machine.

There is, too, a keyboard stencil cutter which makes 75 Gothic addresses in an hour.

Addressing Machines. Hand-operated, foot-lever, electrically driven, and automatic models are made by all manufacturers.

For limited lists, hand-operated models are furnished.

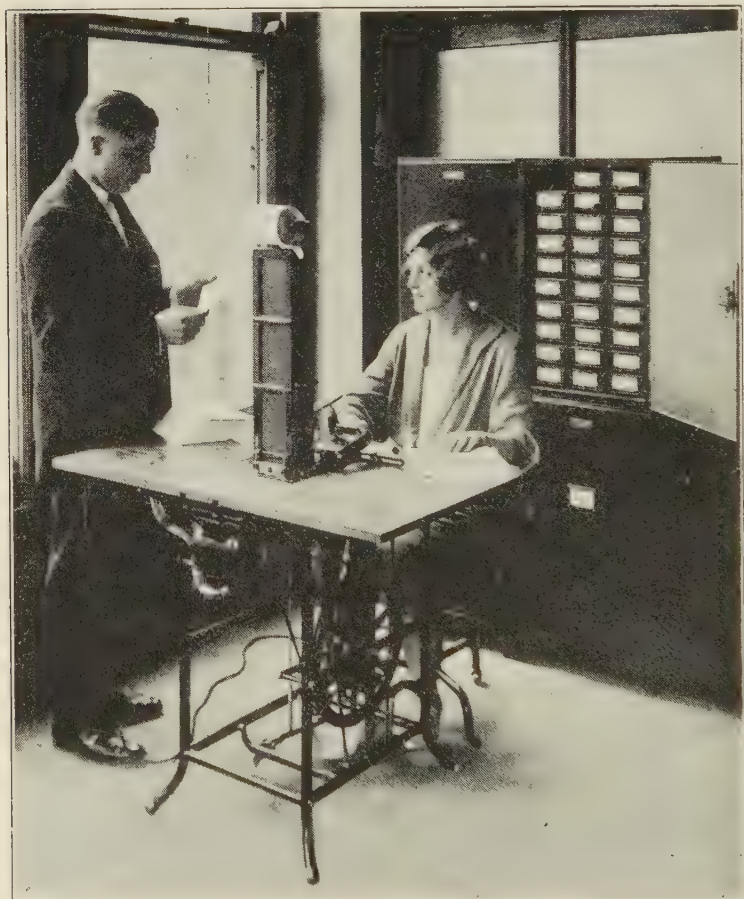


Figure 178: The arrangement of the addressing machine and of the case clearly demonstrates what little space is required to set them up.

The stencils are placed in a hopper corresponding to the magazine in other machines, and the operation of the handle causes them to move to the printing position where the envelope, or other matter to be addressed, is inserted and, after the imprint is made, they move along the runway into the lower hopper. Addressed forms are automatically ejected simultaneously with the printing operation. Repeating attachments are furnished on some models for obtaining more than one impression from a stencil. The speed of these machines depends on the operator, but the average number of impressions obtained is from 1,000 to 1,500 an hour.

By means of a printing attachment one machine can be converted into a small-form printer for printing post-cards, price lists, and various other forms. (See Figure 184.)

Because they operate so similarly to machines which employ metal address plates, a description of foot-lever and electrically driven models would be but a tedious repetition. The skill of the operator determines the number of addresses which can be made in an hour with the foot-lever machines—anywhere from 1,500 to 2,000. The motor-driven machines work at the rate of 1,500 to 6,000 addresses an hour, depending on the speed with which the operator feeds the matter to be addressed.

For addressing envelopes, mailer strips, proof sheets, and for printing the addresses directly on the margins of newspapers and periodicals, automatic machines have been devised. Some models cut wrappers from a roll of paper, and print name, address, corner card, and mailing permit at a speed of about 10,000 to 15,000 an hour. Figure 176 clearly illustrates this type of machine. Some print a mailer strip to be used in a mailer machine; others at the same time print and cut proof sheets which are bound for record. These machines automatically pick expired stencils out of the file and file them in a separate drawer. Certain models count and register the number of subscriptions at a speed of 7,500 an hour.

Gas, light, power, water, telephone, and other public utility companies use a public service bill addresser for handling duplicate and triplicate forms.

A machine which addresses ordinary envelopes may be changed to permit the addressing of filled envelopes, mailing strips, wrappers, newspapers, and magazines directly on the margins (Figure 179). By means of an attachment which takes stencils of post-card size for the printing of post-cards and notices this type of machine functions as a duplicating machine.

The stencils are filed in drawers housed in storage cabinets.

OTHER MACHINES PRINT FROM TYPE SLUGS¹

The third and final division in our classification includes that type of equipment which utilizes linotype, intertype, or linograph slugs for printing. The items of this equipment are, first, ordinary slugs produced by typesetting machines; second, the addressing machines themselves; and third, filing equipment for holding and housing the slugs in special galleys.

Address Slugs. Any style or face of type can be used to set up the mailing list. (Imitation typewriter type can be used if desired.) The slugs consist of either one, two, three, or four lines, from $1\frac{2}{3}$ to $2\frac{5}{6}$ inches long. One manufacturer provides a clip for holding the name to facilitate changes in the address.

Linotype, Intertype, or Linograph Machines. The slugs are cast on machines of this type by an experienced operator. Of course, the machines are never used in connection with addressing work only, but primarily for setting up copy for newspapers, magazines, books, and so forth.

¹Machines of this type are manufactured by such companies as The Challenge Machinery Company; The Typaddresser Company.

Addressing Machines. Machines of this class are operated either by a foot-treadle or by motor.

Before being placed in the magazine of the foot-treadle machine, as in Figure 180, a galley of slugs containing from 50 to 125 names is inked with printer's ink. The first address in the galley is at the opening in the table of the machine directly under the printing head. The matter to be addressed is fed to gages on the feed table and, as the treadle is depressed with the foot or by the power mechanism, the printing head comes down and brings the paper into contact with the inked type. Releasing the treadle causes the next address to be brought to printing position and the one just printed passes on into the receiving magazine. Type and linotype matter can be used by inserting a steel "liner" at the head.

The machine illustrated in Figure 181 prints from linotype, linograph, or intertype slugs. The galleys used with the machine pictured in Figure 181 are inked with printers' ink. An electric light notifies the operator when the end of a city or route has been reached, so that a large wrap-

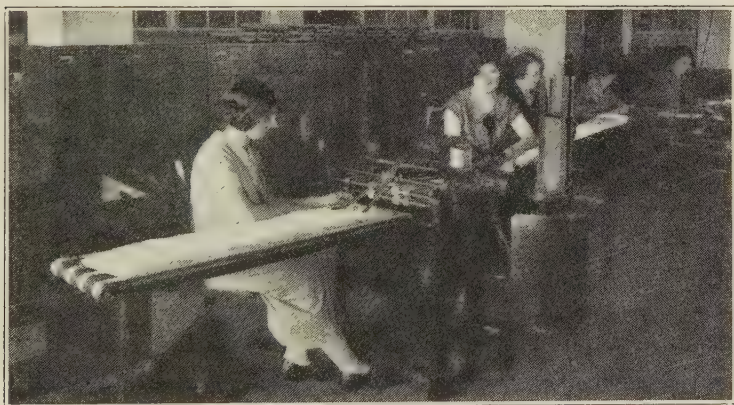


Figure 179: Economy and efficiency in addressing are attained by a system carefully worked out for particular needs. Publishers use high-powered machines like this one. The matter to be addressed is fed directly to a drop roll, carried to the printing point by tapes, and then stacked uniformly. See page 434.

per can be printed and put around the bundle. An electric light of a different color signals when the end of a galley has been reached. Depending on the skill of the operator, 3,000 to 4,000 impressions can be made in an hour.

Another motor-driven machine prints through an inked ribbon. This machine can be operated at a speed of 2,000 to 3,000 addresses an hour; skilled operators can attain a



Figure 180: This illustration shows how a galley of inked slugs is placed in the magazine of an addressing machine which prints from linotype slugs cast on a linotype machine. Read about this class of addressers on page 435.

speed of 5,000 impressions. Clips are provided for holding two- and three-line addresses together. Figure 185 demonstrates the method of printing on the margins of newspapers.

The galleys with addresses may be systematically and compactly stored in cabinets designed especially for them (see Figure 169).

ADDRESSING MACHINES DO MORE THAN ADDRESS ENVELOPES

The scope of the use to which various types of addressing machine equipment can be put is almost unlimited. There is not a single business—be that business small, medium-sized, or large—which could not profitably use a machine of some type in the speeding up and handling of some part of its work. Literally thousands of addressing machines are already successfully used by manufacturers, wholesalers, retailers, dealers, banks and trust companies, lodges, churches, publishers and printers, public service corporations, stock and bond brokers, trade unions, theaters, railroads, hospitals, mail-order houses, associations, schools and colleges, real estate firms, laundries and cleaners, insurance companies, commission merchants, dairies, creameries and bakeries, governments—city, state, and national—doctors, dentists, nurseries, horticulturists, hotels and restaurants, public buildings, and so on. While some use large machines, others use small models—there is a type and style especially adaptable to every business, and they are priced to fit every pocket-book.

The specific uses to which this type of office machine may be put are many and varied. For instance, it can be profitably used in marketing; recording; shipping; collecting; disbursing; routing; pay-roll work, and straight addressing.

Straight addressing is the most common application of all uses of addressing machines. Straight addressing specifically means, first, addressing notices of meetings; second, ad-

addressing envelopes; third, addressing publications; fourth, addressing membership cards; fifth, addressing identification tags; sixth, imprinting names and addresses on strips for mailing newspapers or printing directly on the margins of newspapers and on the covers of magazines.



Figure 181: Type slugs are used with addressing machines of the type shown here. When addressing is done directly on the margins of newspapers and periodicals an electric light signals the end of a city or route so that the operator can print a large wrapper for the bundle. An electric light of a different color signals the end of the galley.

The following specific applications completely illustrate the usual demand for addressing machines.¹

Marketing. Back in the days when the addressing machine was in its infancy, direct-by-mail advertising was virtually unknown. It has been only in the last 15 years or so that the business world realized that direct-by-mail advertising is one of the most potent of all marketing or mass selling methods. Consequently, although the addressing machine was originally intended as merely a means of cutting down routine labor in addressing, it has grown to be one of the most successful methods for winning sales—helping salesmen between calls, enthrusting dealers, or selling direct to consumers. So the greatest application of the addressing machines now is, to use a broad term, marketing. Specifically, under the head of marketing come these uses:

1. *Direct-by-Mail Advertising.* Speedily and accurately, names and addresses that look just like the highest class of typewriting, though produced from 10 to 50 times faster, are placed on letters, circulars, envelopes, cards, and so forth. Of course, other forms, such as return cards, dealers' names, and so forth, also are imprinted.

2. *Indexing Reference Data.* Indexing of potential sales data for ready reference is important not only to direct-by-mail advertising but also to analyze market possibilities. It is important to determine the value of a name—the purchasing power which permits effective and efficient mailing of the advertising. Most concerns maintain a card-index record of each name—its purchasing power, the frequency of purchases, nature of merchandise generally purchased, and other such data, which can be kept on the record card address plate or stencil that does the addressing. Notations as to recent purchases (dates, amounts, and so forth),

¹It is, of course, patently impossible specifically to point out the many machines and models which perform the various operations which are described from this point on. Even so, the reader should be able to determine from the foregoing text the class of equipment best suited for the performance of the specific work mentioned. However, should this prove impossible, the publishers will be glad upon inquiry to refer those wanting additional information concerning any phase of work mentioned herein to the proper manufacturers.

dates and styles of follow-ups, and other information to be posted, may be inserted on an index card at the time of addressing—before an impression is made and while the index card is at the printing position. Reference to the index record gives the operator a visible X-ray of every customer and prospect on the list.



Figure 182: The uses to which addressing machines may be put are many and varied. Thousands of concerns are using them profitably in marketing, recording, shipping, collecting, disbursing, and routing. After the imprints are made by this type of machine, the stencils refile themselves in the drawer. From 1,500 to 4,000 addresses can be printed in an hour on this motor-operated machine. See page 433.

3. *House Organs.* The value of a house organ depends fully as much upon maintaining a fixed mailing schedule as upon the contents of the publication itself. The success of many house organs has been jeopardized and even defeated by failure to get them mailed to salesmen, dealers, employees, or customers, as a result of clinging to slow, tedious hand methods. The addressing machine speeds the house publication into the mail, for the simple reason that it addresses the publication envelopes 10 to 50 times faster—and without chance of error.

4. *Salesmen's or Dealers' Lists.* Again the addressing machine is a big factor, because it enables a firm to put timely "pep," confidential, and informative bulletins in the post-office quickly and frequently to lists of names furnished by salesmen and dealers.

Recording. Under this heading a complete description of the forms on which the addressing machine is used is virtually an impossibility, because these forms are almost as varied as there are existing companies in the United States. But generally speaking, the subject of recording applies to:

1. *Any Office Record upon which Names and Data are written.* The addressing machine can be accommodated to almost any form for reducing clerical work, by imprinting names and data at least 15 times faster than the same work can be done by typewriter or by hand. Uniform accuracy, legibility, and businesslike neatness on all forms are also strong points.

2. *Shop Orders.* Every shop, factory, or workroom must use forms in order to tell what, and how much, to manufacture during given periods. Most factories are operated on the system that a production department is to the factory what a train dispatcher is to a railroad. The larger the factory and the greater the number of departments concerned, the more forms there must be prepared for the production of an article or articles. This information, in most instances, is merely a repetition of previous shop orders. Consequently, in shop-order work, the addressing machine is a remarkable time- and money-saver, because it puts data on all kinds of shop orders and routine forms, such as cost-keeping records, as easily as it addresses envelopes, and it eliminates the human element that is so apt to breed heavy losses through errors in copying vital information, such as quantities, sizes, and so on, from one record to another. For example, simply

by addressing a few cards, in a couple of hours one manufacturer of tractors dispatches shop orders throughout the entire big plant for making many tractors, each having more than 1,500 parts. This use is becoming universal very rapidly.

3. *Inventory.* The addressing machine has made inventory work a simple task instead of the terrible weeks of drudgery that most concerns experience using hand methods. By printing names and data concerning parts in stock on ruled sheets, it is an easy



Figure 183: Better methods create better business, thousands of executives agree. That is why they are buying the equipment described in this chapter. Page 437 will tell you that the machines' uses are not limited to straight addressing. Motor-driven models like this one are described on page 426.

matter to take inventory every day, week, or month, regardless of the size of the stock on hand. Of course, there are two basic kinds of inventory. One a record for fixtures, furniture, tools, and so forth, and the other a moving stock record. But the application of the addressing machine is very similar in either case. In fact, one corporation supplies inventory cards to a dozen or more branches every month, these cards having been addressed previous to shipment. Each branch office, as well as the headquarters, keeps a perpetual inventory on these records simply by adding and deducting stock movements. And each month every branch office reports on sheets the amount of stock on hand of each of 150,000 kinds of parts. In this manner, big corporations can accurately and promptly tell on short notice just how much stock they have on hand throughout the entire United States and Canada.

4. *Cost-Keeping Records.* Like inventory, cost keeping with the aid of the addressing machine is very closely related to shop orders. In fact, the method generally employed is that the same forms, which tell the various factory departments what to do, also show the cost of each part and the labor rate so that when sorted according to cost distribution, they provide quick, accurate data on "overhead" and production costs. This information is transferred to the sheets showing complete data relating to each part.

Shipments. Quite naturally every package or crate, or other article, transported from one section of the city to another, or to another city, shows name and address and often shipping route, or parcel-post zone, and so forth. The most common method of addressing such packages is to print, on shipping tags, the name and address of the persons or firms receiving them. Tags are not the only form which must be addressed in handling shipments. There are way-bills and labels and schedules to be made out. In each case the addressing machine effects a great saving through its speed, accuracy, and convenience.

1. *Tags, Labels and Bills-of-Lading* being so closely kindred are usually addressed in the same manner and practically at the same time.

2. *Scheduling* is an application that is increasing rapidly, for the simple reason that business concerns everywhere are getting

down to the more scientific basis of timing shipments. Many firms have remarkable systems in operation, annually saving them a vast amount of money and, at the same time, speeding up their shipments, an important factor in building up greater patronage and stimulating earlier collections.

For example, one large mail-order house, through the use of an addressing machine, is able to fill each order and send it on its way within 2½ hours after the order is actually opened and read. The addressing machine fits in closely with the scientific systems made possible by the latest efficiency methods and devices developed to supply the needs of large shippers, whose very life depends upon minimum operating cost and maximum satisfaction to customers.

Collections. Here is one of the greatest needs for an addressing machine. Speed, above all else, is vital to collection success. The story of the early bird applies. Statements, bills, and so forth, received *first* are, generally speaking, paid *first*. Tedious, slow, pen or typewriter addressing methods delay collections because such obsolete addressing requires so much time and effort that it is almost impossible to get statements into the mails promptly on the first of each month or other collection mailing days. Addressing-machine speed solves the problem.

1. *Insurance Premium Notices and Receipts.* Practically all insurance companies in the United States, Canada, and Europe fill in all the data necessary on millions of premium notices and receipts each year. It is the boast of many of these insurance companies that, because of an addressing machine, they are able to collect all their policyholders' premiums and supply them with receipts without even so much as the scratch of a pen. Here again addressing-machine speed and accuracy are vital features. To illustrate the saving, one big insurance company was able to reduce the cost of collecting policyholders' premiums by 75% through the use of an addressing machine. Another company places its saving at \$50,000 a year.

2. *Statements.* Hardly less in importance, though the applications are not so large, is the use of the addressing machine in heading up and dating statements, by thousands of commercial and semi-commercial organizations. Among these concerns are included public utilities which, while they do not head up and date statements, imprint bills generally in two or three positions,

necessitating duplicate or triplicate imprinting. In this sort of statement addressing, accuracy is of as much importance as speed, because it is a well-known fact among credit men that many accounts have been transferred from one firm to another simply because of personal pique at the misspelling of a name, or a wrong initial or address due to careless hand addressing. An indexed record in connection with individual names showing



Figure 184: The envelopes are inserted at the printing point one at a time, and as the handle is operated the impressions are made and the stencils pass on to the lower hopper of this type of machine. One model can be converted into a form printer, as told on page 433.

purchases eliminates any possibility of erroneously forwarding the statements to non-purchasers, as well as promptly following up all delinquent accounts.

3. *Notices.* Like insurance companies, many semi-public and fraternal organizations use addressing machines in collecting weekly, monthly, or annual payments of dues or fees.

4. *Real Estate and Rental Offices* find the addressing machine a speedy means of filling in names, addresses, dates, and amounts on rental notices and receipts.

5. *Ledger and Collection Sheets.* Nearly every organization that collects money by means of a notice or statement has to list the same names and data on ledger sheets or statements of collections. To illustrate: The practice of insurance companies is to list numbers of policies, amounts of premiums, names, and due dates on collection sheets for the use of branches which must follow up the collections. Laws in some states require that virtually the same information be submitted to the state insurance department as evidence of the fact that premium notices and receipts have been prepared and mailed. The addressing machine lists names and data in proper columns, with even spacing between items, at a speed from 15 to 30 times faster than it can be done by a typewriter.

6. *Bookkeeping.* In order to keep a record of money due, ledger pages are a necessity. The addressing machine heads up ledger pages as easily as it does statements, thus reducing valuable bookkeepers' labor and eliminating errors in copying by hand.

Disbursements. Accuracy in making out disbursement forms is just as important a factor as it is in making out collection forms. Most all people are honest, but it is unfortunately a fact that money paid out through mistake is often difficult to get back. Mistakes may occur in the amount to be paid out, or in the name, number, or address of the person or firm receiving it. Speed is vital when a great many people must be paid in a short time. Where hand methods are used, it is often the case that disbursements are more expensive to make than collections, because valuable clerks turn from important work to write the same names, numbers, and other data over and over again at

more or less frequent disbursement periods. The addressing machine prints these data on a great variety of disbursement forms with 100% legibility and utmost speed.

1. *Time Cards.* Most all factories, stores, or offices require their employees to register their arrival for work and departure with numbers designating employees. It is an easy matter, where hand methods are used, to mix the numbers in pay-roll work. In addition, there are all kinds of names—long ones, short ones, easy-to-spell and hard-to-spell names. Even the most careful clerks copy them inaccurately. But the addressing machine prints right names correctly with right clock numbers at high speed—the amount or kind of data makes no difference in the speed or accuracy.

2. *Pay-Sheets.* Every organization having a pay-roll must keep a record of wages paid. Because it automatically feeds and spaces pay sheets, and prints names, numbers, rates, occupations, in desired columns 15 times faster than a typist can type them, the addressing machine soon saves its cost on any pay-roll of 100 names or more.

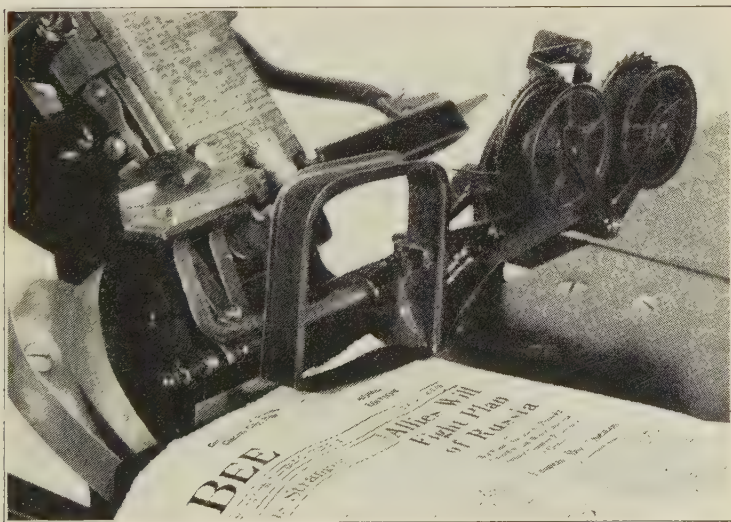


Figure 185: This shows a slug ready to make an imprint on the margin of a newspaper. Printing is done through an inked ribbon. A speed of from 2,000 to 5,000 addresses an hour can be attained, depending on the skill of the operator. See pages 436 and 437.

3. *Envelopes and Checks.* Employees are paid by cash in envelopes or by checks. In putting names, numbers, and other data on pay envelopes or checks, the addressing machine produces a large saving.

4. *Dividends.* Equally important to pay-roll disbursements come dividends. Accuracy and speed in handling dividend sheets bearing stockholders' names, notices of stockholders' meetings, stockholders' proxies, and dividend checks are nowhere else better demonstrated. This work corresponds in a large degree to handling a pay-roll with the addressing machine, although the disbursements are not as frequent.

5. *Statements and Checks.* Another important use of the addressing machine that cuts office routine and expense is heading up statements of accounts paid, and filling in names and data on checks. Most every concern buys from month to month from the same firms. So, when bills are paid, the greater proportion of the checks and "bills paid statements" are repetitive name-writing that is reduced to small expense with the addressing machine.

Routing. This heading covers a very wide use of the addressing machine by many lines of business whose success depends upon prompt, rapid, and accurate delivery of goods of some kind. These lines of business often are related to another, but on the other hand there are many firms or organizations using the addressing machine for "Routing" which are far removed from other lines. Illustrative—

1. *Bakeries* address names and addresses of customers, amount of goods to deliver, date, and so forth, on sheets for their delivery departments.

2. *Laundries* similarly use the machine for guiding drivers on their calls for laundry and for delivery a day or two later. This has proved especially valuable to laundries, because, until this class of business recently adopted modern methods, they were literally at the mercy of their drivers, who virtually owned their routes.

3. *Dairies'* use closely parallels that of bakeries.

4. *Creameries* route the delivery of cream and butter according to shipping routes designated by numbers which may mean either railroads, or express zones. They also route their deliveries of butter, ice-cream, and so forth.

5. *Linen Suppliers, Cleaners, and Dyers* have a routing method very similar to that of laundries.

6. *Newspapers*. In the conduct of a newspaper, one of the very great tasks that the operative force encounters every day is lightning distribution. The addressing machine provides top-notch speed in addressing wrappers for bundles which must be routed according to train times and lines. Data of this sort appear with the name and address. (The addressing of individual newspapers, either mailed separately or inside the bundles, is covered under a separate heading.)

7. *Magazines*. The same problem solved for newspapers also is overcome in routing magazines, although, of course, there is a longer period between publication dates. Nevertheless, speed and accuracy are just as important, because magazine circulations generally run larger than those of newspapers of relative importance.

8. *Factories*. Routing also covers the continuity of manufacture of articles in factories. The use for factory routing is almost inseparably associated with factory shop orders discussed in a previous paragraph. Most shop orders, printed with the addressing machine, show each department handling a given job, the number of the department from which it will receive the articles in process of manufacture, and the department to which they must be delivered.

9. *Post-offices*. Imprinting labels for mail bags. Most post-offices have labels imprinted in sets for trains, in the order of their departure, which are used daily. The use of an addressing machine for printing these labels effects a great saving in their addressing.

One equipment is constructed so that it is practically automatic. The address cards—one for each label—are filed in the order of train departure, and when placed in the machine automatically pass through, returning to the starting point after printing and again going through the same operation. This automatic method of feeding and refeeding the labels permits as many sets of labels being printed as are desired. Labels feed automatically from a roll, being cut off to the desired size to fit the mail bag and stacked in proper order according to train departure—the same as the cards.

Modern business conditions demand less human effort in handling routine work. Wherever it is possible, machinery

is now doing the work heretofore done by slow, inaccurate, inefficient hand methods. Office appliances have eliminated, to a considerable extent, the possibility of human error, and have greatly added to the volume of work turned out by office workers.

The foregoing chapter, dealing with Addressing Machines, points out conclusively the superiority of mechanical devices over hand methods. Practically all lines of business can increase the daily output of office routine work with little additional cost. The savings on the clerical labor alone should more than make up for the cost of installing modern mechanical devices.

XXVI

MAILING-ROOM EQUIPMENT

Inefficient mailing-room methods retard business. A machine for every need. Mechanical envelope openers. Hand stamp affixers. Parcel-post machines. Sealing machines. Combined sealing and stamping machine. Permit, meter, and precanceled-stamp systems: metering-permit machines; non-metering permit machines; how precanceled stamps are used. Mailing equipment saves money.

INVESTIGATION reveals the fact that a large percentage of the day's labor in the average office is expended in the dispatch of mail. According to the report of the Postmaster-General for 1923, there was a 50% increase in letter mail during the five-year period 1918 to 1923. Small wonder it is that hand methods of getting out the mail necessary to carry on modern business have been found hopelessly inadequate and that inventive minds have concerned themselves with the perfection of machines to expedite mail work and alleviate its burden.

The great growth of business by mail is due in no small measure to the typewriter, which increased letter-writing, to the broader use of direct-mail advertising, and to the perfected postal system, which speeded up the delivery of mail. But to meet the problem of the ever increasing amount of business carried on by mail it was necessary still further to substitute mechanical for human effort. In answer to the demand came duplicating machines for the preparation of vast numbers of letters and circulars, folding machines to help get this matter ready for sending, and addressing machines to eliminate time and errors in addressing.

The principle of efficiency which operated to equip offices with labor-saving devices of various kinds, however, seems to have lost its breath before it reached the mailing room.

The mailing department, judged by the treatment it received, might have been regarded as the poor relation of the business family. At length, after the need for better methods had become acute, several types of mailing-room machines were placed on the market.

Every phase of an enterprise—financing, selling, collecting, shipping, purchasing—depends to a large extent on the dispatch of mail, and inefficient and inadequate methods may seriously retard business. Modern mailing devices not only save money, but they also eliminate errors and delays both in the mailer's office and in the post-office; and no executive can afford to overlook mechanical means which save time, man-power, and money, and give better results. Ever in search of means for attaining increased efficiency, the alert business man is usually quick to see the value of a device which reduces operations to a minimum of time and labor.

A MACHINE FOR EVERY NEED

The several mechanical adjuncts to the modern mailing room considered in this chapter have been designed to cope with the problems of businesses of all kinds and sizes, and the prospective buyer of such equipment cannot fail to find a device particularly suited to his requirements.

Mailing devices fall into the following classes:

Envelope Openers	Metering Permit Machines
Stamp-Affixing Machines	Non-Metering Permit
Parcel-Post Machines	Machines
Sealing Machines	Postmarking Canceling
Combined Sealing and	Machines
Stamping Machines	

Each of these types will be described separately in the following sections. It should be borne in mind that, as in the treatment of other equipment, an attempt has been made to present the various machines and systems in such a way that the reader may have a general idea of the devices available

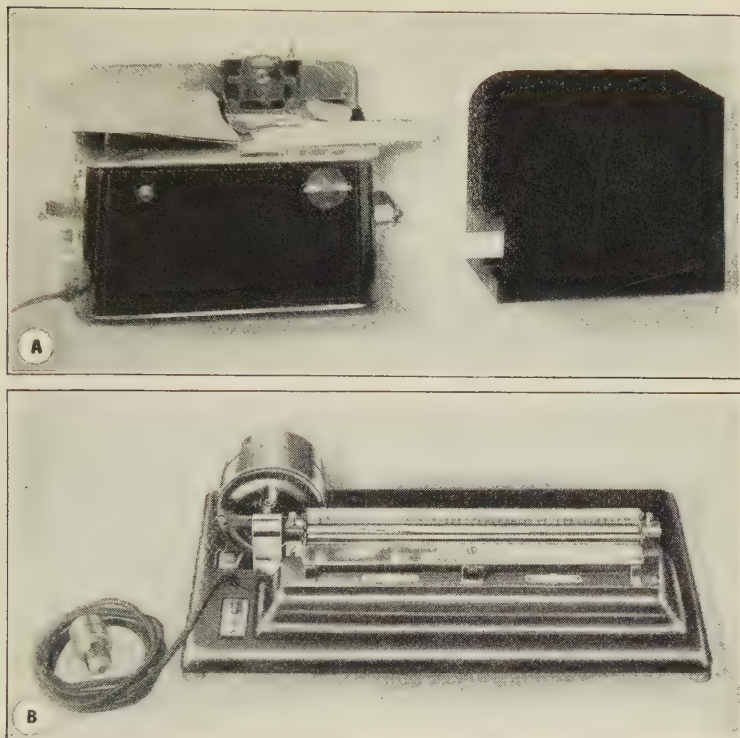


Figure 186: Envelope openers save time for every one in the office who in any way takes action on the incoming mail. Electric models slit envelopes 25 times faster than the work can be done by hand. For small concerns with less mail, hand-operated machines are available. A description of mechanical envelope openers is given below.

so that he may go more wisely about the selection of a particular machine to fill his needs.

MECHANICAL ENVELOPE OPENERS¹

Machines such as those pictured in Figure 186 have practically replaced the old method of opening letters by hand.

¹Machines of this type are manufactured by such companies as The Bircher Company, Incorporated, and The O.K. Manufacturing Company.

They may be obtained in either hand-operated or motor-operated models, and can be adjusted to handle envelopes of different thicknesses. Since the machines open the envelopes by making a very fine cut, there is no danger of damaging the contents.

Two circular knives turning at a high rate of speed are the cutting medium of the machine shown in A of Figure 186. The letters are fed to these knives one at a time by a rubber feed-belt. A fine edge is shaved off the envelopes, and they are carried across the platform with sufficient speed to stack them in a container at one end of the machine. One hand-operated machine of this type opens 200 envelopes a minute; the motor-operated model opens 500 a minute.

Three winding shear edges on a revolving steel cylinder working in connection with the cutting edge of a shear plate do the cutting on the machine shown in B of Figure 186, on page 453.

This type of machine, too, is available in both hand-operated and motor-operated models. The machine is so constructed that the cutting edges can be removed from the machine for resharpening whenever this is necessary.

HAND STAMP AFFIXERS¹

Five operations—picking up, moistening, severing, attaching, and counting—are done at one time with a stamp affixer (Figures 187 and 188). Stamps provided in rolls of 500 by the Post-Office Department are locked in a compartment of the device and by the operation of a plunger they are affixed to the envelopes. There are some hand stamp affixers which moisten the envelope and others which apply the moisture to the stamp. The amount of protection varies with the model.

¹Manufactured by such companies as Multipost Company; Standard Mailing Machines Company.

Some affixers are equipped with a spring lock which enables the operator to close the machine after inserting the stamps, without the necessity for using a key.

When locked, other models can be put in operation only by the person having the key—a different lock being used for each unit.

In addition to guarding against operation by unauthorized persons, certain machines offer the further protection of recording the stamps used. The recorder in some models is operated by the plunger; in other models, the stamps are accurately counted, and the counter record is read after the



Figure 187: A stroke of the plunger and the stamp affixer cuts off, moistens, counts, and affixes the stamp. Or do you still cling to the wasteful loose-stamps-in-the-drawer method? The section on stamp affixers tells how such a device saves time, provides a clean and orderly system for handling stamps, and establishes a method of accounting for them.



Figure 188: Stamp affixers are made in several models varying in the degree of protection offered. The stamps, obtained in coils, or rolls, are locked in a compartment. The type shown above is locked against operation by unauthorized persons and, in addition, counts the stamps used. See pages 454 to 457 for full details.

stamps have been inserted and the container locked. At any time, a second reading will determine how many stamps have been used.

Affixers like that shown in Figure 188 count the stamps by means of a recorder on the container, this location preventing the record from being altered even should the machine be operated without the container. It is possible to equip this machine with extra stamp containers for handling stamps of other denominations and at the same time to keep a record of each denomination.

All models of one make can be equipped with these extra containers, either with or without recorders. Where conditions do not justify the purchase of more than one complete machine, but where two or more denominations of stamps are used, these extra stamp containers allow quick change from one denomination to another.

The success of, and the large demand for, this type of stamp affixer has prompted the Post-Office Department to issue six denominations of stamps in rolls for this mailing-room equipment.

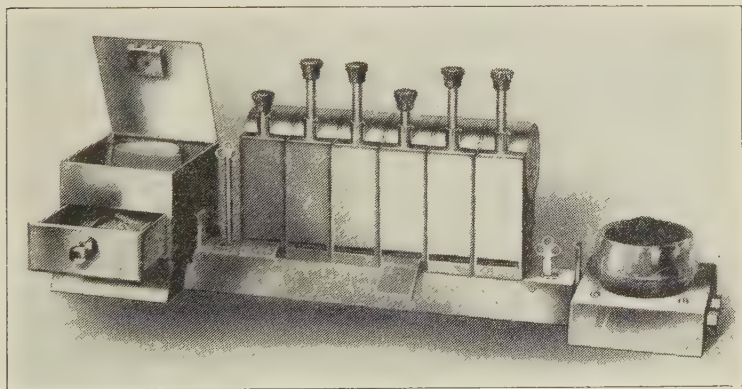


Figure 189: A parcel-post machine eliminates confusion, wasted time, and wasted stamps in the office where parcel-post packages form a part of the outgoing mail. Made in sections to accommodate stamps of various denominations, the device carries a moistener at one end and a drawer cabinet at the other.



Figure 190: No matter how much mail an office dispatches each day, there is a sealing machine especially designed for that bulk and kind of work, as you will learn from reading the description on page 459. With this hand-operated model, 200 to 300 envelopes can be sealed in a minute.

PARCEL-POST MACHINES¹

In offices where parcel-post packages form a part of the outgoing mail, a machine such as the one shown in Figure 189 provides a compact and safe receptacle for stamps, keeps them under lock and key, makes it possible to select immediately the desired number of each denomination, and affords a convenient, sanitary method of moistening, as well as an accurate means of recording, them.

As is evident from the illustration reproduced on the preceding page, the machine is made in sections; therefore, as

¹Parcel-post machines are made by such companies as Multipost Company.

many sections as are required may be used. Further, this type handles all denominations of stamps (precanceled, or not) which may be secured in coils for just such use. This model carries a moistener at one end and at the other a drawer cabinet for special-delivery or other stamps. Any combination or number of drawer cabinets can be obtained with this model.

Two keys are provided: one for the person responsible for the stamp-account, used for locking the stamp containers into position; the other, the operator's key, used to lock the machine against operation by unauthorized persons during the operator's absence.

Three different models are obtainable.

SEALING MACHINES

Devices such as that shown in Figure 190, designed to seal from 3,000 to 15,000 envelopes an hour, have entirely replaced the sponge method in the modern office.

Figure 190 shows an envelope-sealing machine which automatically separates, feeds, moistens, and stacks envelopes of any standard size and thickness. The flap of the envelope is moistened by a positive vacuum feed suction principle, which is of simple, all-metal construction, without wicks or moistening rolls. Hand models of this type seal about 200 envelopes a minute; electric models, on the other hand, can seal as many as 300 per minute.¹

In devices like those illustrated in this section, envelopes are fed into the machine where the gummed flaps come in contact with a moistening device. In most sealing machines a set of sealing rollers compress the flaps and the envelopes are ejected from the machine.

Moisture is applied to the flap either with a wick, a roller, a metal disk which receives its supply of water from a reservoir, or by a positive feed suction.

¹Made by such companies as Standard Mailing Machines Company.

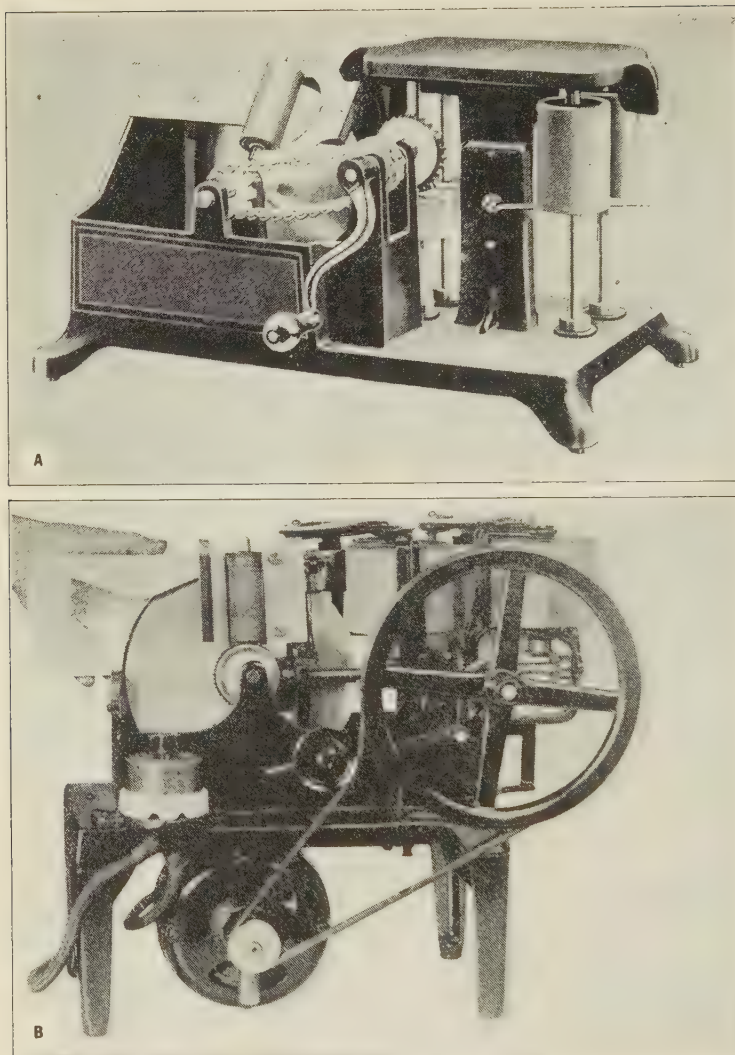


Figure 191: A section beginning on page 459 treats of sealing machines. As the envelopes are fed into the machine, the flaps come in contact with a moistening device. After the envelopes are sealed between a set of sealing rollers they are ejected from the machine. A, above, is hand-operated; B is motor-driven.

Some machines have devices for controlling the amount of moisture applied to the flaps. One type of sealer,¹ for example, has a valve on the water reservoir. The moistening device on this sealer consists of a metal roller. This machine is available in both hand-operated and motor-operated models; the hand-operated machine will seal 9,000 envelopes an hour, and the motor-operated model will seal at twice that rate. Both models will seal envelopes with the flaps either telescoped or flat. They will handle envelopes of any length, the flaps of which are not more than $3\frac{1}{2}$ inches wide, and of any thickness up to $\frac{1}{4}$ inch.

Envelopes are fed into one machine by a metal blade, moistened by a rubber roller. This machine, too, has a means for regulating the amount of moisture applied, so as to take care of the differences in the amount of moisture necessary to accomplish effective sealing of envelopes of different kinds of paper. It is fully automatic and can be obtained in either hand-operated or motor-operated models.²

Another machine³ automatically feeds and separates the envelopes, and seals them by means of a revolving disk, the lower part of which is submerged in water. This model can also be adapted to stamp-affixing, non-metered permit, and precanceled-stamp systems.

Another model of the same make, shown in Figure 192, takes all varying lengths and thicknesses of envelopes but must be adjusted for width. The envelopes are picked from the hopper and fed through the machine on a rubber belt at a speed of 12,000 to 15,000 an hour. The moistening device is a metal blade which may be adjusted so as to supply the right amount of water to different kinds of paper. This model may be had equipped with a permit printer, or

¹Machines of this type are made by such companies as The Bircher Company, Incorporated.

²This type of sealer is made by such companies as The Multipost Company.

³Machines of this type are made by such companies as The Postage Meter Company.

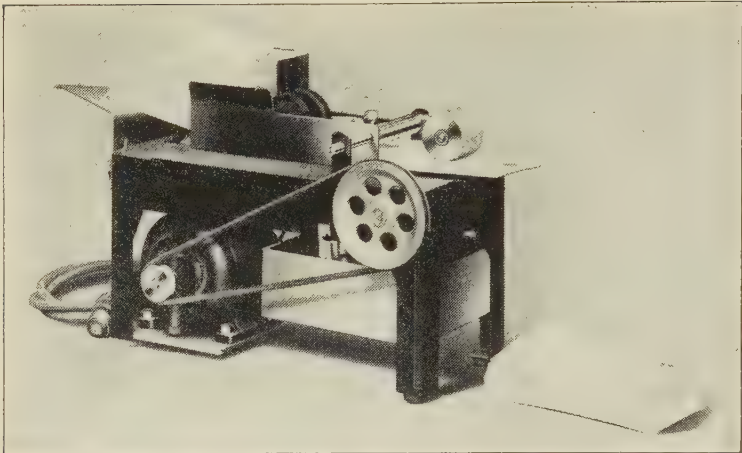


Figure 192: When there are machines which can seal envelopes at the rate of 3,000 to 15,000 an hour, it is readily apparent that savings will result from the installation of such a device. The model pictured above can be equipped to handle permit mail or to seal mail with precanceled stamps attached.

postmarking and stamp-canceling attachment, as described on the opposite page.

Envelopes are fed to the machine illustrated in A of Figure 191 one at a time by laying them on the slanting feed-plate. A revolving cone-shaped device applies water to the flaps. No adjustment is necessary for different sizes or thicknesses of envelopes. The speed of this model is about 4,500 envelopes an hour.¹

Another model consists of two electrically operated feeding and sealing devices combined into one unit. This model operates at a speed of 12,000 an hour.

The moistening device of the sealer shown in B of Figure 191 is a metal disk. Envelopes up to 7 inches wide, any length and any thickness, can be sealed with the hand-driven model at the rate of 100 a minute. The electrically driven model has a capacity of 150 a minute; with an automatic feed, 175 can be sealed in the same length of time.²

¹This type of sealer is made by such companies as Reynolds Envelope Sealer Company.

²Made by such companies as Sealograph Company.

COMBINED SEALING AND STAMPING MACHINE

The combined sealing and stamping machine—motor-operated—does the work of both an envelope sealer and a stamp affixer in one operation.¹ Using it, an operator can seal, stamp, and count about 250 envelopes a minute. Stamps for first-, third-, or fourth-class mail, obtained from the post-office in coils of 500 or 1,000, are locked in the machine. As it is affixed to the envelope, each stamp is automatically registered. The moistening device of the sealer consists of a metal disk revolving in a tank of water. The sealer can be used without the operation of the stamp affixer, or the stamp affixer can be used without the operation of the sealer. Precanceled stamps may be used in the machine, adapting it to the precanceled stamp system; also, it can be adapted to the non-metered permit system.

PERMIT, METER, AND PRECANCELED-STAMP SYSTEMS

All matter mailed without stamps affixed comes under the general Post-Office classification of permit mail. For the past 20 years, pamphlets, catalogs, and similar pieces have been sent with the non-metered permit indicia printed directly on the envelope by a printing press. This practice was extended to first-class matter by the Post-Office Department on September 1, 1920, simultaneously with the necessary approval of the metering type of machine. The regulation provided for the printing directly on the envelope—in the office of the mailer—the permit, or indicia, as it is called, illustrations of which are reproduced in Figure 195, page 467. The impression must show the postmark—month, date, and year—the denomination, and the mailer's permit number, but in the case of first-class permit mail, metered or non-metered, the date is required and the hour may be shown in the postmark. Under the general Post-Office

¹Such companies as The Postage Meter Company make machines of this kind.

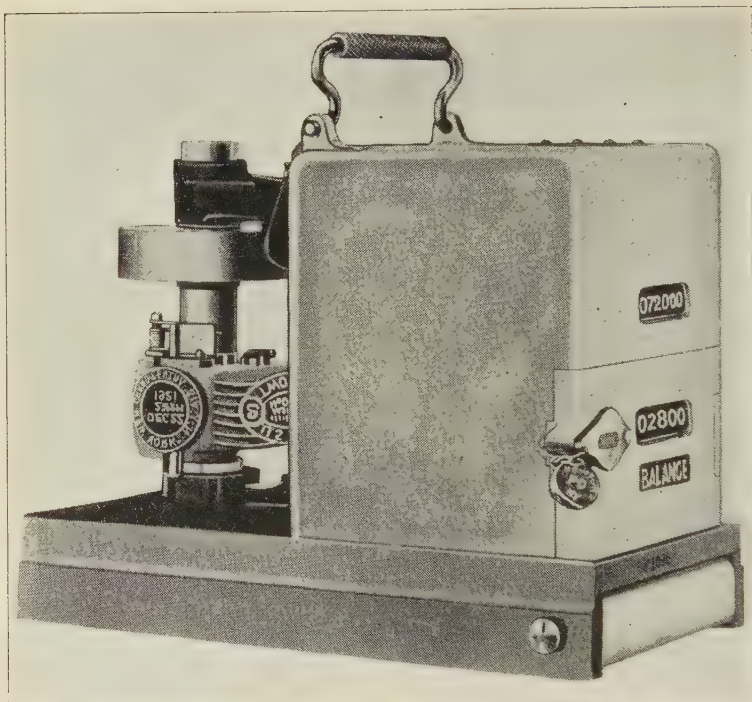


Figure 193: This printing and recording mechanism, the basis of the metering permit system described on page 466, is demountable from the sealing machine so that it may be taken to the post-office, where it is set for a given number of impressions.

classification of permit mail are two distinct classes officially designated as devices not having recording mechanisms to be set by the postmaster, and devices having recording mechanisms to be set by the postmaster. To use either system a license must be obtained from the Post-Office Department at Washington through the local postmaster,¹ and all mail so handled must be delivered to the

¹The present conditions under which mailing of certain matter will be accepted without stamps affixed are provided by Section 459, Postal Laws and Regulations. Detailed information as to regulations may be obtained from your postmaster.

post-office by the sender, because special provisions have been made for separate handling of such mail, which eliminates facing, postmarking, and canceling, otherwise required.

On August 7, 1924, the Post-Office Department passed a regulation allowing first-class matter to be sent out with the

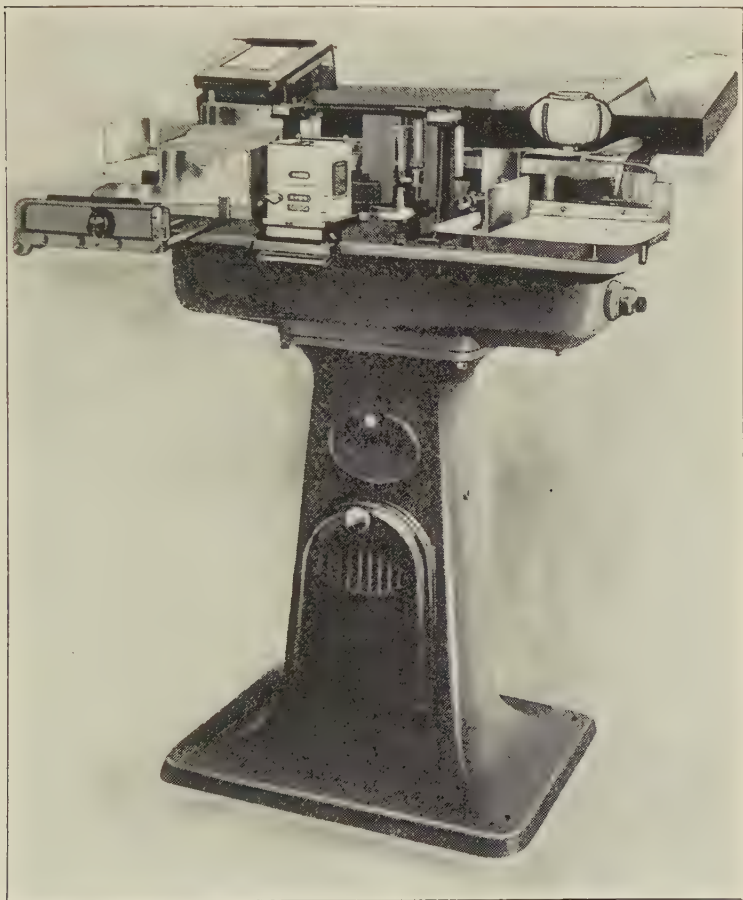


Figure 194: With the increase of letter mail came a need for means of expediting its delivery. Several systems described in this chapter eliminate delay, save time and money, and otherwise bring about more satisfactory results in the mailing room. Above is a machine of the metering permit type.

precanceled stamps attached, thus bringing into existence another system of simplified mailing.

The man interested in the installation of a system for expediting the dispatch of mail will find himself confronted with the problem of selecting one of these three methods. Claims for each are, of course, advanced by its exponents, but because of their controversial nature, they have no place in a book whose mission is not to recommend any particular method, but merely to acquaint the reader with the up-to-the-minute devices for lightening his office work, so that he may make investigations for himself. Only by making a careful survey of his mailing needs and a thorough study of each system can he make a selection which will be of greatest benefit to his organization. He will find that he must take into consideration the kind of business, whether goods are sold directly to the consumer by mail or to dealers or agents or by salesmen, what percentage of his mail is first-class, the amount of parcel-post matter, and other conditions pertaining to his organization.

Following is a brief treatment of the three systems—metered permit, non-metered permit, and precanceled stamps—which will give the reader an idea of the characteristics peculiar to each.

*Metering-Permit Systems.*¹ Metered mail is imprinted with a stamp, canceled, and postmarked in the mailer's office. A printing and recording mechanism licensed for use under rules and regulations issued by the Post-Office Department is the basis of the meter system of mailing. The meter is demountable from the machine so that it may be taken to the post-office for setting (see Figure 193).

This meter is used with a sealing machine. The machine is set at the local post-office for the number of impressions desired, and when this is done the amount of postage paid for is shown. The meter automatically locks when such impressions have been exhausted and serves as the means for

¹Meters cannot be sold outright.

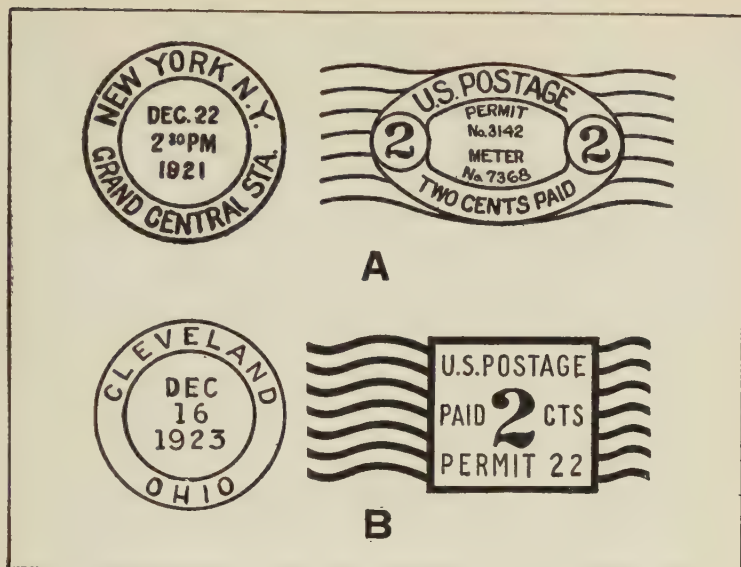


Figure 195: Illustration B shows the indicia printed by the non-metering type of permit machine. It shows the postmark (month, date, and year), the denomination and the mailer's permit number. Metered-permit mail carries the indicia seen in Illustration A, showing, in addition, the hour of mailing and the meter number. These systems are described in this section.

the collection of postage and the verification of the mail. The indicia are shown in illustration A of Figure 195. The postmaster locks and seals the meter after he sets it and he keeps the key.

Note the two dials or registers of the meter illustrated in Figure 193. These two dials indicate the total amount of postage used and the amount of postage not used. Thus, as the meter is operated, the counters register, one adding, the other subtracting. When the amount of postage paid for has been registered, the printing head automatically locks and can be unlocked and reset only at the post-office station.

As the meter handles only one denomination of postage, a separate meter must be used for each denomination of postage used. Each denomination is printed in the same



Figure 196: You cannot afford laborious methods when there are mechanical means of handling detail work. This is as true in your mailing room as in any other department. The above illustration shows the permit printing type of machine described on page 469 making short work of a stack of mail.

color as that of the stamp for which the indicia are used. As has been stated, sealing machines are used in conjunction with the metering machine.

The machine shown in Figure 194 is designed for heavy service. It will print the indicia on 250 envelopes a minute and at the same time seal them. Any size envelope up to $\frac{3}{8}$ -inch thick can be fed into the machine without making adjustments. When the envelopes have been printed and sealed they are automatically stacked ready for typing into bundles. Special devices¹ can be attached so that the machine will count envelopes, key cards, and receipt and date post-card statements.

Another machine, shown in Figure 199, imprints pieces of mail at the rate of 150 pieces per minute. A feature of this

¹Made by such companies as The International Postal Supply Company and The Postage Meter Company.

machine is the automatic feed of envelopes; the mail being placed in the hopper and automatically fed, separated, imprinted, postmarked, canceled, and stacked. This machine may be had with or without the locked cabinet. Envelopes as large as 12 x 12 in size can be printed without adjustment.

Non-Metering Permit System. Machines adapted to this system of mailing are equipped to *print the indicia, seal the envelope, and count the pieces.* Illustration B of Figure 195 shows the indicia imprinted by this type of machine. Each mailing must be accompanied by a statement signed by the person to whom the permit is issued, showing the permit number, the class of matter, the number of pieces, and, when identical, the weight of a single piece.

Payment must be made with each individual mailing or by carrying a cash balance at the post-office. The mail is checked by a postal clerk to verify the mailer's count.

A number of machines for printing permits¹ are shown in this section. Eight hundred pieces of mail can be imprinted and counted in a minute by one motor-driven machine. It handles envelopes up to $\frac{3}{8}$ of an inch in thickness.

Figure 196 illustrates a counting, sealing, and indicia-printing machine which is electrically operated.²

A set-back counter, equipped with lock and key, counts the pieces as they pass through the machine. Only envelopes which are being imprinted can be counted. When a batch of mail is to be handled, the counter of the machine is set at zero. The count when the batch is completed is equivalent to the number of postage stamps of the given denomination which are to be paid for or charged to the firm's deposit at the post-office. The machine may also be used for handling second- and third-class matter. When it is so used, the date

¹Such companies as International Postal Supply Company of New York manufacture this type.

²Made by such companies as the Standard Mailing Machines Company.

stamp is taken off. Each of the three functions of the machine—imprinting, sealing, counting—can be performed independently of the other functions. A sealing machine previously described and illustrated in Figure 190 may be equipped with a permit printer to handle permit mail.



Figure 197: The permit printing attachment may be removed from this machine so that it may be used to seal and stamp mail with stamps obtained in coils from the post-office. Among the many types of machines on the market you will find one that answers your purpose exactly.

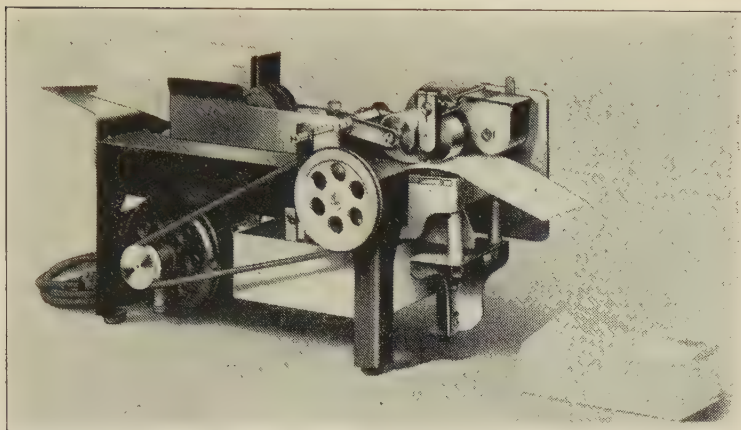


Figure 198: Precanceled stamps are now used on first-class mail. Obtained in coils from the post-office, they are affixed by stamp affixers described on page 454. The envelopes are then passed through a sealing machine, like the one above, equipped with a device for printing the postmark and additional cancellation.

One type of machine¹ is adapted for use under either the metered or non-metered permit system without mechanical alteration.

How Precanceled Stamps Are Used. With this system of mailing, precanceled stamps obtained in coils from the post-office are used. After postage has been affixed by means of a stamp affixer (described in a previous section) or if government stamped envelopes have been used, the mail is put through permit machines which seal and count the envelopes, print the postmark showing the city and date of mailing and, at the same time, put on the stamp the additional cancellation required by the Post-Office rule.

In concerns where the bulk of mail does not warrant such a machine, the precanceled stamps are put on with the affixer, and the postmark and necessary cancellation printed on the envelope with a rubber stamp which has a changeable date.

One type of machine is adapted to the metered, non-

¹Manufactured by such companies as The Postage Meter Company.

metered, and precanceled-stamp system without mechanical alteration.

Another machine which affixes precanceled stamps is the combined sealing and stamping model which is shown in Figure 197.

MAILING EQUIPMENT SAVES MONEY

Any machine which saves time and money and accomplishes tasks with increased accuracy finds a ready welcome in the modern office, because the alert business man realizes that if he is to meet competition successfully he must do away with antiquated methods.

It will be readily apparent to the man who has read through this chapter that there is a mailing equipment to suit the needs of every size office. A logical question is "How have other businesses profited by the use of such equipment?" In other words, what, specifically, will a certain machine do for a business? Granted that it does save money, how is it done? It may be well, since several distinct types of mailing-room equipment are treated here, to devote a few paragraphs to the accomplishments of each.

The speed of the machine which seals envelopes recommends it. From 7,000 to 12,000 envelopes, depending on the size of the model, can be sealed in an hour with such a machine. With such devices available, no office can afford to employ hand and sponge methods.

In sealing and stamping mail by hand, the only means by which a check upon the postage can be established is by a triple count; first, a count of the envelopes, then a count of the stamps, and finally a recount of the envelopes after the stamps are affixed. To constitute a real check this work must be performed by a responsible employee. It is a costly and laborious operation at best.

Absolute safeguards against stamp losses can be obtained by the use of devices which account for each stamp as it is issued from a locked compartment and affixed to the

envelope, and of those machines which seal and stamp envelopes, automatically accounting for the postage used.

These devices eliminate absolutely the indiscriminate and promiscuous handling of stamps, with the almost inevitable losses incident thereto, and confines all responsibility to one



Figure 199: The type of machine shown above imprints mail at the rate of 150 pieces per minute. Special features of this model include automatic feed, separation, imprinting, postmarking, and cancelation. For full details see page 468.

employee, who is protected in such responsibility and upon whom the machine maintains a complete check, thus eliminating all chance of loss and possibly false accusation and suspicion.

Both meter and permit machines reduce the hazard of handling stamps, together with the accompanying losses, and appreciably increase the efficiency of the mailing operations.

An excellent protection to the postage-stamp account is afforded also by the machines which affix precanceled stamps to mail, because precanceled stamps cannot be used except by those who have permits to use them. Besides protection, there is the advantage of immediate dispatch from the post-office.

This is, of course, only the briefest review of the outstanding service rendered by mailing equipment. But these very few paragraphs should convey to the reader something of the worth of modern methods of handling mail and lead him on to investigate this class of office appliances.

XXVII

SHIPPING-ROOM AIDS

Assuring the safe arrival of shipments. Tape sealing machines: hand-operated sealers; semi-automatic sealers; automatic sealers. Wax sealing machines. Package-tying machines. Label-pasting machines. Label-moistening devices. Stencil-cutting machines. Stencil brushes. The value of shipping-room equipment.

UNDENIABLY it is bad business to send out thousands of dollars' worth of merchandise in badly wrapped, sealed, and addressed packages; yet every year an almost inestimable waste of money and labor is caused by the lack of proper shipping-room tools. There have even been instances where the entire work of important manufacturing plants was held up because of the non-delivery of indispensable materials, due to bad wrapping and marking. Not only do the shipper and consignee lose actual dollars, but the carrier's loss in the way of claims is tremendous. Such conditions result in a general dissatisfaction, the outcome of which often means a serious business loss as well as a time loss.

Several shipping-room appliances, which make proper wrapping and marking easy, are in use in all up-to-date organizations. There are machines which seal packages with gummed tape, others which seal with wax; machines which tie packages, and still others which paste labels, or which cut stencils. Each of these machines cuts costs, speeds up the work, and assures safe delivery of shipments.

TAPE SEALING MACHINES

Many concerns now use gummed tape for sealing packages. The device which makes it possible to cut and moisten quickly any length of gummed tape saves a great deal of

time, labor, and material for small concerns and retail stores as well as for shipping departments of large concerns. Two kinds of tape may be used: plain or specially printed tape. There are three types of tape sealing machines: the hand-operated; the semi-automatic; and the automatic. A description of each type follows.

*Hand-Operated Tape Sealers.*¹ The tape sealing machine which moistens, cuts, and measures any length tape and issues it from the machine by means of pulling it out by hand is here called the hand-operated type. This machine consists of a metal device which holds a roll of gummed tape, a water container, a moistening device, and a cutting device. The tape is inserted in the rack and then threaded over the moistening and the cutting devices. It is operated, as the name indicates, merely by grasping the edge of the tape and pulling it out to any desired length. After the tape has been moistened to a certain length, it is pulled upward against the sharp edge of the knife and cut.

*Semi-Automatic Tape Sealers.*² A machine which moistens, measures, and cuts any width of tape is termed semi-automatic. Like the hand-operated device, this type of machine consists of a metal frame which holds a roll of gummed paper, a water container, and a mechanism which guides the tape over a moistening device and through a cutting device. Two kinds are available; one moistens the tape with a roller revolving in a reservoir of water;³ the other employs a brush as a means of applying moisture.⁴

A downward pressure on the operating carriage of the roll-

¹Manufactured by such companies as Metal Specialties Manufacturing Company; Nashua Package Sealing Company, Incorporated; J. F. Ryan and Company; V. J. Van Horn Company.

²Manufactured by such companies as Better Packages, Incorporated; Emmert Manufacturing Company, Incorporated; Nashua Package Sealing Company, Incorporated.

³Manufactured by such companies as Emmert Manufacturing Company, Incorporated; Nashua Package Sealing Company, Incorporated.

⁴Such companies as Better Packages, Incorporated, make this type of machine.

er type causes the desired length of tape to pass over the roller. A return stroke of the carriage cuts it. Some machines measure the tape by pressure on the operating carriage (Figure 200); others measure by means of a lever turned to indicate the desired length on a scale (Figure 201). Models are made to handle different widths of tape; some carry several widths at the same time.

Another semi-automatic moistening device—a rubberset brush in a tank of water—is the distinctive feature of the machine pictured in Figure 202. Two scientific principles, capillary attraction and gravity, acting against each other, regulate the flow of water automatically. The tape is fed over the moistened brush and measured by a pull on

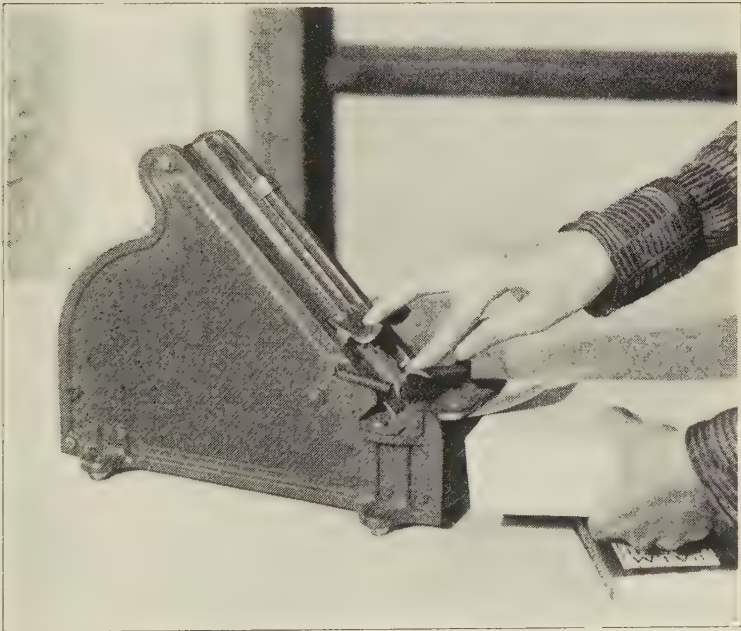


Figure 200: Moistened tape is issued from this semi-automatic sealer by operating a little carriage that slides on a track as illustrated here. Any length of tape may be obtained simply by moving the carriage up and down the runway until the desired length is delivered. Read page 476 for further details.

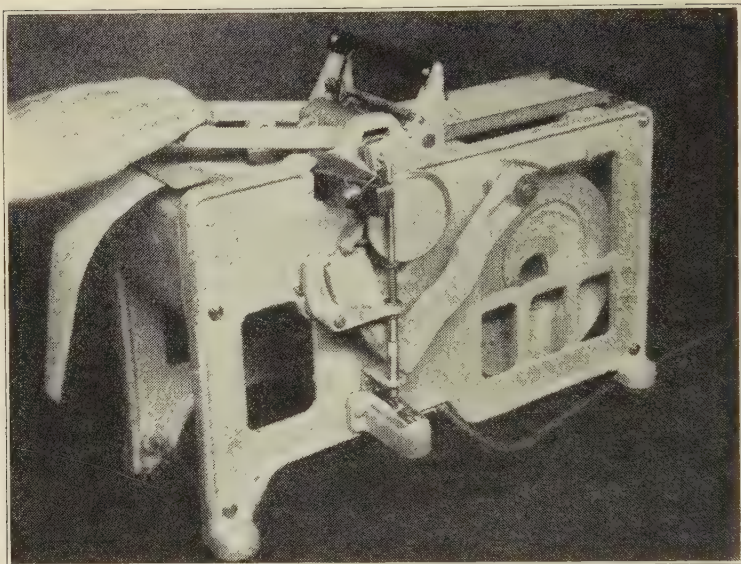


Figure 201: Here is shown the roller type of semi-automatic tape sealer. This machine moistens, measures, and cuts any width of tape and ejects it on pressure of the hand lever.

the operating carriage and cut off by a touch on the cutting shear.

*Automatic Tape Sealers.*¹ This type of machine moistens gummed paper and cloth tape and cuts it into desired lengths from 4 to 45 inches, with a regulator for fractional inches. Such machines handle tape from one to four inches in width or two or more rolls with a total width of four inches. The operation is entirely automatic—ejecting, moistening, and severing the tape with one movement, such as the pushing down of a lever (see Figure 203). Another machine² of this type is motor driven and equipped with an indicator similar to a speedometer on an automobile, that indicates

¹Manufactured by such companies as the Emmert Manufacturing Company, Incorporated; and the Nashua Package Sealing Company, Incorporated.

²Manufactured by such companies as the Nashua Package Sealing Company, Incorporated.

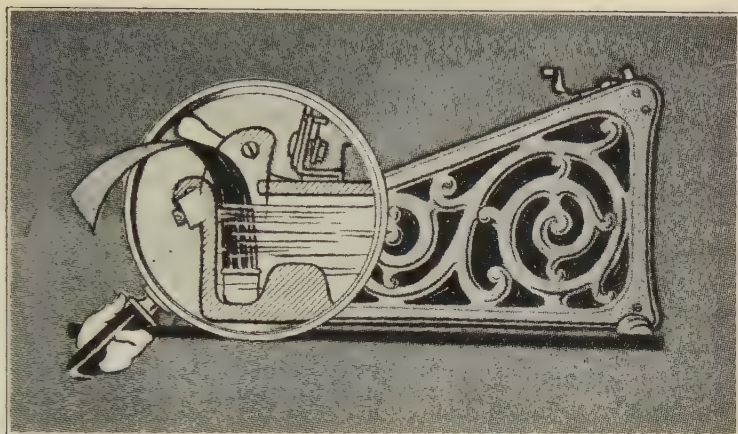


Figure 202: Above is shown one type of semi-automatic moistening device. A rubber set brush in a tank of water moistens the tape which is measured by a pull on the operating carriage and cut by a touch on the cutting shears.

the amount of tape being fed out. Figure 204 illustrates how two rolls of tape may be carried.

WAX SEALING MACHINES¹

A machine which will seal packages, letters, and important documents acts not only as a great time-saver, but also as a security against unauthorized persons opening mail or tampering with papers or packages. The wax sealing machines consist of a heating unit which may be described as a handle through which a cord passes to a heating element within the heating cap. An arm which carries the seal is attached to the heating unit in such a way that it may be easily operated in conjunction with this melting iron and yet remain a separate unit so that it does not become heated. Figure 205 shows how the arm extension bearing the seal is always ready to stamp the insignia upon the melted wax wafer.

¹Wax sealing machines are manufactured by such companies as The Electric Seal Company; Safe Seal Manufacturing Company.

In order to stamp a seal, a wax wafer, which may be obtained with the wax sealing machine, is placed on the paper and the heater is applied, thus melting the wax. When the stamper bearing the seal is pressed upon the wafer, a perfect impression is obtained. This feature is of special value when important documents must have a certain seal affixed. Banks, bond houses, and, in fact, a vast number of other business houses, use the wax sealing machine to great advantage.

PACKAGE-TYING MACHINES¹

Packages, boxes, and bundles may be securely tied for shipment by means of a machine which automatically wraps cord around a parcel, with sufficient tightness, and then ties a secure knot and cuts the cord. The entire process takes only a fraction of the time required to tie packages by hand, and thus reduces labor costs considerably. Furthermore, packages are tied so securely that possible damage to the contents is practically eliminated. Economy of material, as well as of time, money, and labor, is another advantage which mechanical package-tyers offer.

Figure 206 shows a package-tying machine which handles, without adjustment, different sizes and types of packages, ranging from 1 inch to 20 by 20 by 6 inches, at the rate of 20 to 30 pieces a minute.

To operate the machine the package is placed on a platform which is the uppermost position of the machine. Then the twine, which is placed on a rack at the base of the machine, is threaded through the machine and carried to the tying apparatus at the L-shaped arm under the platform. The machine is operated by a motor which is controlled by a pedal-like foot-lever. This lever, when depressed, starts the motor.

In one operation the turntable model ties both ways, crossing the string and tying one secure knot. When the pack-

¹Package-tying machines are manufactured by such companies as B. H. Bunn Company; National Bundle Tyer Company.

age is placed on the platform, and the motor started, the platform makes a right-angled turn, crossing the string, thus making the tie. The extension-arm model is made in two styles—single, and double wrap. The single wrap is one wrap of string and one knot, and the double wrap is two wraps of string and one knot, resulting in a tighter tie. The twine is carried about the package by a long L-shaped arm which revolves around the platform upon which the package is placed. The length of the arm depends on the size of the package the machine can handle. The tying mechanism is placed beneath the platform on which the package rests.

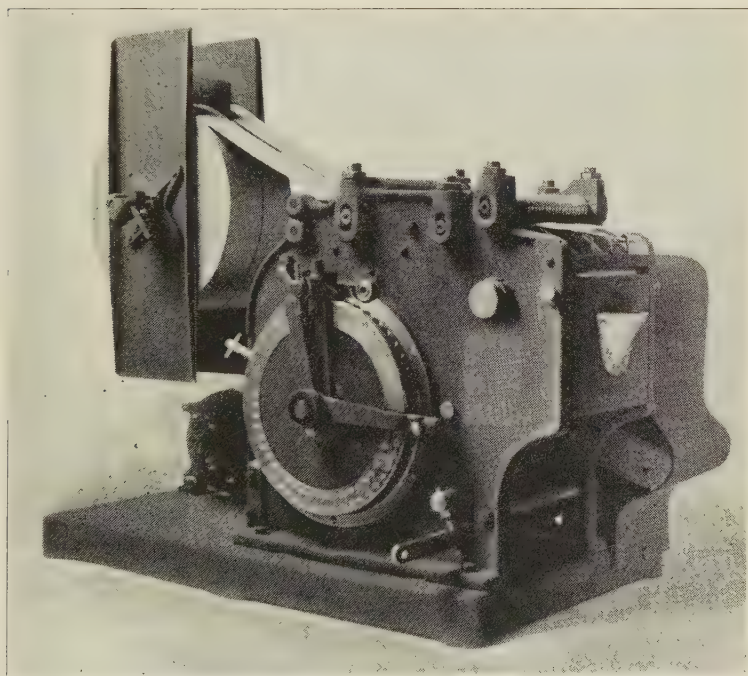


Figure 203: The automatic tape sealer shown here carries two tape rolls. To operate this sealer it is necessary only to set the dials for the desired lengths, the action being entirely automatic—that is, a motor furnishes the power for ejecting, moistening, and cutting the tape in one movement of the lever arm.

See page 478.

The kick-off carton model has an attachment which automatically throws the package clear of the machine, permitting one operation to take care of both the stacking and the tying operation. This increases the number of packages handled by one person.

Figure 207 pictures a machine which ties packages of any shape and any size up to nine inches high. The package is placed on the platform, and as it passes over the trip the tying mechanism is released. The arm descends and rapidly ties a neat, firm, and uniform knot. Automatically, the arm returns to position. This machine may also be equipped with a presser foot and a floor base. The presser foot is adaptable only for packages which pressure will not injure, and, therefore, the machine is made so that it may be removed or attached at will. Such machines are used in laundries, candy factories, and by truck gardeners for tying all

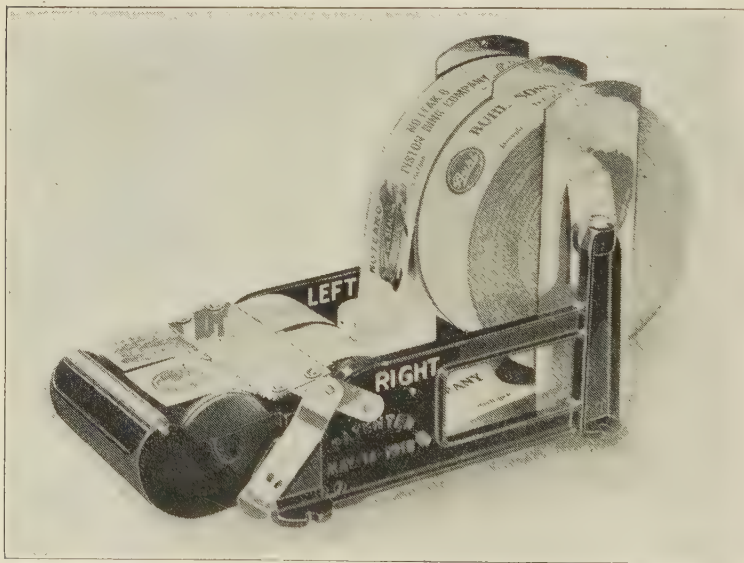


Figure 204: The tape sealer shown above uses two separate rolls of gummed tape. Note how the strips of tape are printed with advertisements of the concern using the device. Also note that this model uses the roll moistener.



Figure 205: Letters, packages, legal papers, such as bonds, wills, and other documents can be sealed by means of this device. The heater melts the wafer, the seal imprints the insignia, and the document is sealed, all in a moment of time. Such a device is not only a time saver, but is also a security against unauthorized persons tampering with papers or mail.

kinds of vegetables. The automatic feeder model operates, as the name indicates, automatically—that is, the weight of the package tripping the mechanism starts the package to the tyer.

There are such numerous types of tying machines that they may be adapted to practically any kind of package tying. They are used extensively by manufacturing con-



Figure 206: This machine wraps cord around a parcel, ties a firm knot, and cuts the cord in a few seconds of time. Note how the L-shaped arm carries the cord around the package. For further details of this machine, see page 480.

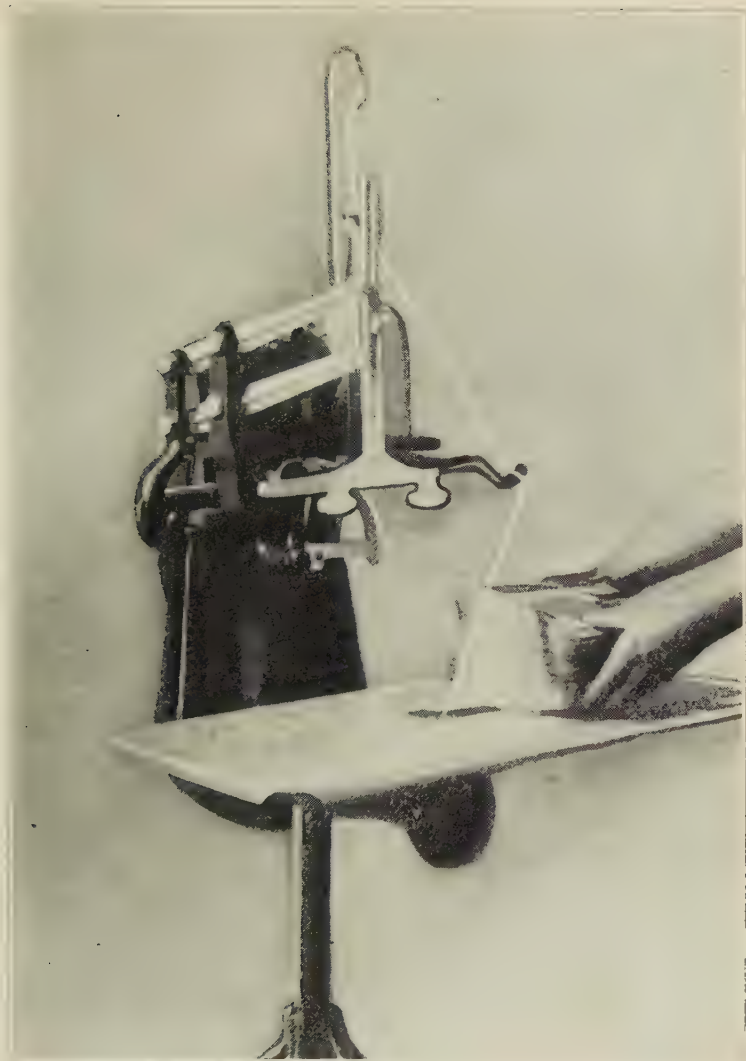


Figure 207: Bundles of any shape or size up to nine inches high are securely tied with this machine. For packages which are uniform in shape and which pressure will not injure, a presser foot is used. The package is placed on the platform and as it passes over the trip the tying mechanism is released. The arm descends and rapidly ties a firm knot. See page 482.



Figure 208: Pasting machines greatly speed up the process of labeling packages, express waybills, and so forth. The hand models are very simple in operation, as this picture shows.

cerns, or, in fact, by any business houses which have large shipping departments. It is true that small concerns as well as large business houses find that package-tying machines handle all shipments so quickly and efficiently that they have become an almost indispensable equipment of the shipping room.

LABEL-PASTING MACHINES¹

With a label-pasting machine one employee can handle the same volume of work as three using the old-fashioned glue pot and brush. In addition to the saving of mucilage and the elimination of brush expense, there is the improvement

¹Label-pasting machines are manufactured by such companies as Bert Jones; Potdevin Machine Company.

in the appearance of the packages and, because of the security of the labels, the assurance that the packages will reach their destination.

There are two types of label-pasting machines, those which are operated by hand and those which are operated by motor power. Both types of machines consist of a mucilage reser-



Figure 209: The moistening device shown here may be used for gummed labels. The tedious and distasteful job of moistening labels is thus eliminated.

For further details of this device, see page 489.

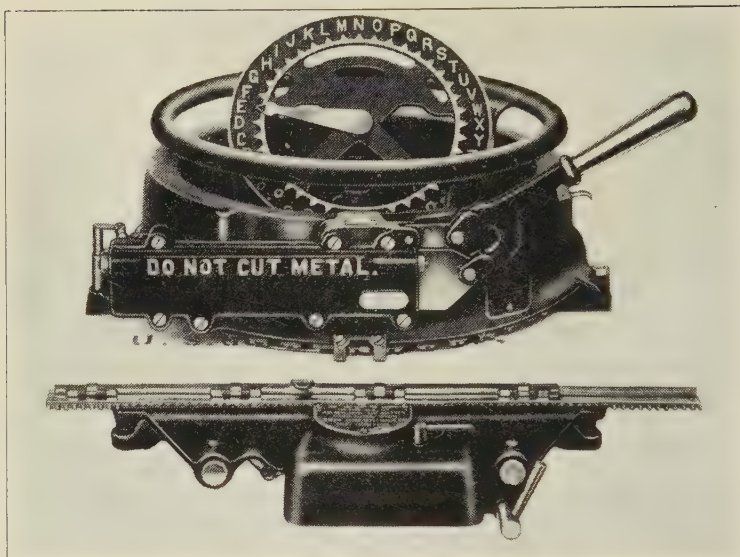


Figure 210: Stencil machines make for safety in shipping. Two different models of the circular type are here represented. Stencils once cut can be filed and re-used at will. For descriptions of stencil-cutting machines, see pages 490 to 493.

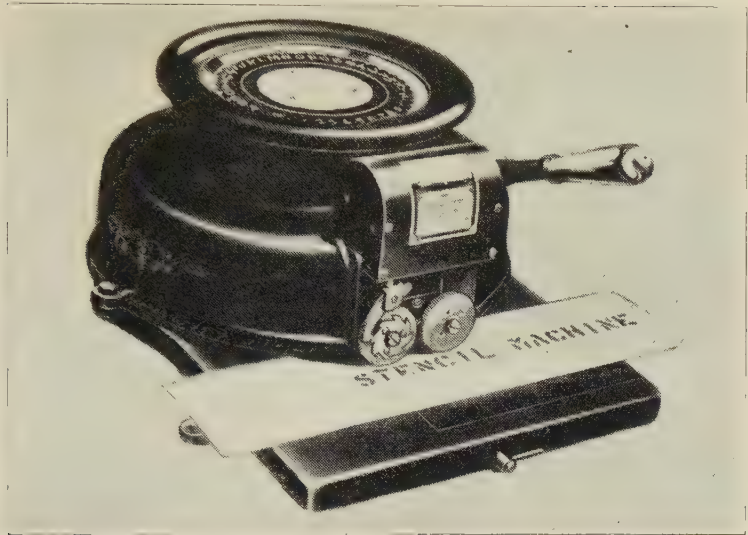


Figure 211: The model of stencil-cutting machine here illustrated is of the automatic positive-feed type. It is different from the friction-feed type in that paper carriage and spacing arrangements are entirely automatic. Complete details are given in the section beginning on the following page.

voir and metal roller or disk (see Figure 208). To operate the hand device, a label is inserted in the machine with the printed side up. As the handle is turned, the mucilage is carried to the surface by a series of disks or a brass cylinder rotating in a reservoir containing the mucilage. When the turn is completed, the label is discharged at a convenient angle, to be grasped by the operator and applied to the package.

LABEL MOISTENERS¹

For moistening gummed labels or envelopes, a device such as that illustrated in Figure 209 is useful. It consists of a water tank in which is set a brush which, by capillary action, brings up the right amount of moisture. The label is passed under an automatic pressor plate which holds it

¹Manufactured by such companies as Better Packages, Incorporated.

against the brush, so that the moisture is evenly distributed.

STENCIL-CUTTING MACHINES

Marking shipments with a cardboard stencil and stencil brush and ink rather than by hand has come to be a common practice in the up-to-date shipping room. The advantages of the stencil method are many, for it eliminates the possibility of misread names, thus removing the chance for loss and delay in transit. When several packages are sent to one address, and when packages are sent regularly to the same address, stenciling effects a great saving in time. In fact, a stencil may be cut, and inked, more quickly than the package can be marked by hand. Further saving of time and labor can be effected by filing the cardboard stencils for further service.

There are two types of stencil machines—the circular¹ and the horizontal.² Figures 210, 211, and 212, illustrate these two types, Figures 210 and 211 showing the circular type and Figure 212 the horizontal type. The circular type is also divided into two classes: the friction-feed, and the automatic-positive feed.³ The friction-feed machine is composed of two principal disk castings holding the punch and dies. The base of the machine serves as a guide for the paper and supports the punch and die disk, the punches or upper letters penetrating through the dies or lower letters to cut the stencil. The stencil board is placed on the table-like platform and gripped between the upper and lower feed wheels. The hand-wheel is revolved until the indicator is opposite the letter wanted. Depressing the handle cuts the letter, and the stencil is moved forward by friction wheels. A half-stroke of the handle gives the space between words. The

¹Manufactured by such companies as Bradley Stencil Machine Company; Diagraph Stencil Machine Corporation; Ideal Stencil Machine Company; and Marsh Stencil Machine Company.

²Manufactured by such companies as the Marsh Stencil Machine Company.

³Manufactured by such companies as Ideal Stencil Machine Company.

operator moves the stencil board in by hand for cutting the next line.

The automatic-positive feed machine is distinguished from the friction-feed type mainly by the automatic paper carriage and automatic spacing features. The stencil board is

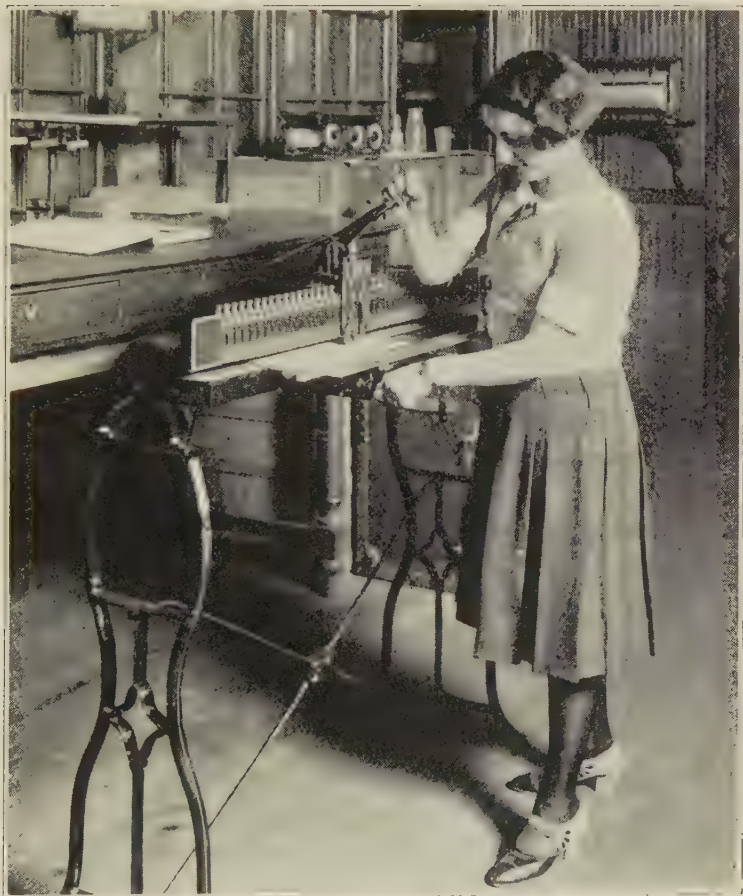


Figure 212: The stencil machine above is of the horizontal or straight-line type which consists of punches and dies mounted in a row. As the depressing mechanism and paper carrier travel back and forth, the paper passes above the dies and under the punches. See the description on page 492.

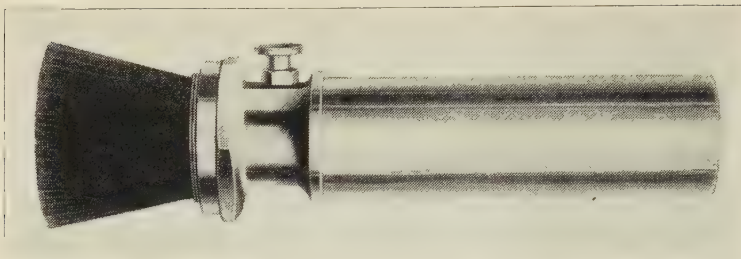


Figure 213: Here is pictured a so-called fountain brush for stencil markings. Ink is released by pressing the button. The hollow handle holds sufficient ink for 1,000 average markings.

held in place throughout the entire cutting operation by the automatic paper carriage, which automatically brings the board back and moves it in position for cutting the next line. Spacing between words and between letters is positive and automatic (see Figure 211).

The straight-line stencil-cutting machine consists of punches and dies which are mounted in a row (see Figure 212). The depressing mechanism and paper carrier travel back and forth, the paper passing above the dies and under the punches. A pointer indicates the letter that is in position at any given point by depressing the hand lever; the cutting punch is forced through the stencil board into the die and advances the board on the carrier to the proper position for the next letter.

*Stencil Brushes.*¹ In using stencils for marking shipments, the brush used is of great importance. While there is a great variety of such brushes obtainable, one—a so-called fountain brush—seems to deserve special mention. This brush has a hollow handle which holds sufficient ink for 1,000 average markings. The ink is released by pressure on a button which causes the ink to flow downward when the brush is in use. Figure 213, at the top of this page, illustrates this device.

¹Manufactured by such companies as the Marsh Stencil Machine Company.

THE VALUE OF SHIPPING-ROOM EQUIPMENT

To make the most of time, to insure the greatest accuracy, each separate and individual part of office work must be coordinated so that the business as a whole runs as smoothly as a well-oiled machine. Especially is this true in the shipping room, where the vast number of details is so apt to delay the work. The importance of the shipping room to the maintenance of the business as a whole is recognized, for in many cases the progress of an entire business depends upon prompt shipment. Furthermore, the relation of a wholesale house to its retail customers, as well as the relation of retail house to consumer, is determined to a certain degree by shipping service. Hence, the success of an important branch of business may hang upon the security of wrapping packages and upon the plainness of marking them.

XXVIII

SCALES

Early attempts to secure weight accurately. Two general divisions. Office scales: computing postal scales; non-computing postal scales. Other scales which add to office efficiency: computing merchandise scales; non-computing merchandise scales; heavy-capacity scales. The importance of the scale in business.

DEVELOPED upon the basic principle of promoting justice between the two important factors of the commercial world—the buyer and the seller—weighing machines today are a potent force in economic life.

To trace definitely the ancient origin and growth of the custom of ascertaining the weight of various articles is impossible, because history has failed to record the time it was not practiced. From historical records one learns, however, that early methods of weighing were, as a rule, inaccurate and unfair, and that often they provoked serious controversies between the buyer and the seller. In fact, often, too, this problem of right or wrong weighing determined whether different tribes or clans were to remain friendly or become hostile.

It is only within the last century that the selling of goods according to value—the second phase of trading—has been developed; and the growth of weighing machines dates from that period.

How truly remarkable the growth of weighing machines has been can best be realized by the fact that in less than 100 years after their introduction they dominate the commercial world. Fully 90% of all businesses today call into service the use of weighing devices, with consequent great savings of time and materials, increased production, and reduced costs of operation.

With the advent of the Parcel-Post System the need for accurate and serviceable scales became indispensable for every office and factory, and new models were placed on the market. Another contributing factor to the growth of the scale industry was the invention and perfection of the modern system to weigh goods at once in the exact money value. In this system the risk of error always attendant upon weighing first in pounds and ounces and afterward calculating the value at a given price per unit is eliminated.

The first patent on a pendulum scale was issued on January 6, 1814, to one Z. Phinney. In 1886 another patent for an automatic weighing machine was granted. Several other patents on the equal-arm or even-balance type were granted in quick succession. These early machines for weighing purposes were not unlike the even-balance scales now in use. The necessary handling of metal weights in quantities equal to the articles weighed, in addition to the handling of the articles themselves, made necessary for practical purposes the multiplying lever or unequal-arm scale. With these scales the article was placed on the short arm and was properly balanced by a much smaller weight placed on the long arm. The old Roman steelyards were the first of this type.

A modified type of this model was arranged so that the scale could be placed solidly upon a table or counter. The chief improvement of this product over the old Roman steelyards type was a pan at the end of the short arm and the counterpoise hanging to the longer end of the lever. Even in using the beam scale it was necessary to handle a number of loose weights on the end of the beam, back and forth, until a balance was obtained. Then the operator added the value of the loose weights to the reading of the beam.

TWO GENERAL DIVISIONS

All these attempts to secure weight accurately seem slow and tedious in comparison with any of the modern weighing machines of reliable make on the market. So thoroughly

is the field covered that there is scarcely a business enterprise anywhere that has not one or another kind of scales specially designed to suit its individual needs.

There are so many diverse kinds of weighing machines that any attempt to give a rigid, unchangeable classification is practically impossible. All weighing devices, whether used exclusively in the office or whether the records obtained from their use contribute to office efficiency, are important

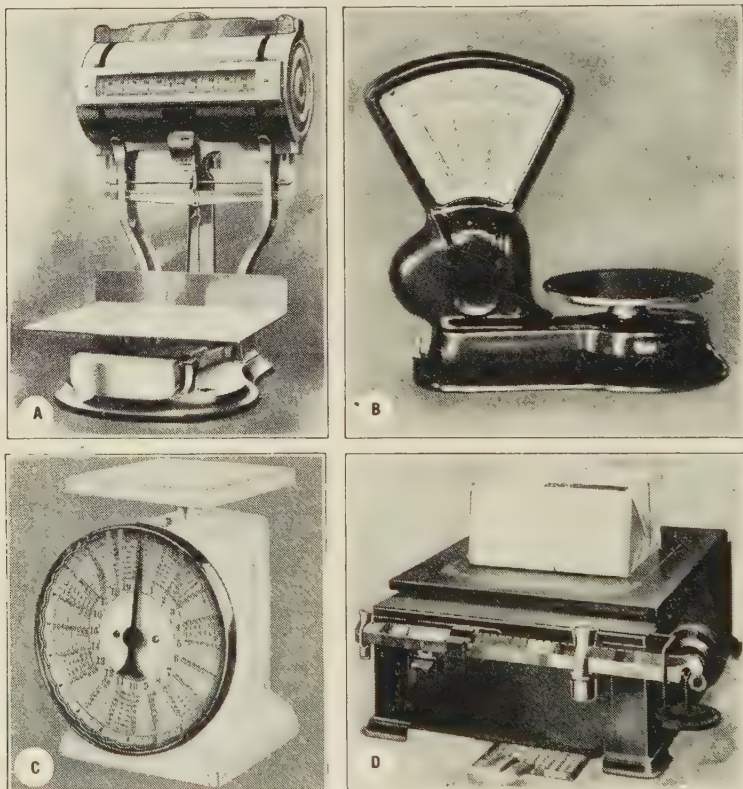


Figure 214: These four scales calculate parcel-post rates. When a package is placed on the platform of an automatic scale (illustrations A, B, and C) the indicator points out the amount of postage due; when on a non-automatic scale (illustration D) packages are weighed by hand and rates determined by the sliding chart. See pages 498 to 504.



Figure 215: The fan-type computing scale automatically indicates the postage amount for the zone to which the parcel is addressed. Parcel-post scales, of which this is one type, are built by practically all companies in a great variety of models. This type of scale is made in capacities ranging from 4 to 70 pounds.

factors in office procedure. So in line with this thought scales are grouped under two general divisions: first, *office scales*; and second, *other scales which contribute to business efficiency*.

In the first major classification—that is, *office scales*—all weighing machines included are referred to as postal scales and comprise first-, second-, and third-class mail, parcel-post, and express scales. For convenient handling, all the so-called postal scales may be further subdivided into computing and non-computing scales.

In the second major division—that is, *other scales which contribute to business efficiency*—are included two general types: first, merchandise scales for retail stores; and second, heavy-capacity scales for industrial plants. In this latter classification only the merchandise scales include the computing feature, the rest being non-computing.

OFFICE SCALES

*Computing Postal Scales.*¹ To meet the requirements of the parcel-post laws, postal scales are made in capacities ranging up to 70 pounds, which is the maximum weight mailable under the postal regulations. First-, second-, and third-class matter—both domestic and foreign—parcel-post and express matter may be weighed and the postage computed. Some features which are generally common to all automatic computing postal scales include: receiving platforms, charts, and dial faces. The beam computing postal scale which is non-automatic is equipped with receiving platform, beam arm, and sliding chart.

Figures 214 and 215 illustrate various office scales, all of the computing postal type. Note how these scales differ in appearance.

In different sizes of postal scales, the receiving platter

¹Manufactured by such companies as Dayton Scale Company division of the International Business Machine Corporation; John Chatillon & Sons, Hanson Brothers Scale Company; Toledo Scale Company; and Triner Scale and Manufacturing Company.

or platform is located in various positions. It may be on top of the scale, at the bottom, or directly in front of the operator. This platform is designed for the one purpose of receiving the letter or parcel to be weighed. (Compare the receiving platforms in the group of illustrations shown in Figures 214 and 215).

The usefulness of postal scales is greatly increased because of the variety of combination charts obtainable. A combination chart may, for example, have a sufficient range to permit the weighing of parcel-post packages as well as first-, second-, or third-class mail, or the weighing of express packages up to 70 pounds as well as parcel-post. In this way one scale may serve two, or more, purposes. It is also possible to use a postal scale for weighing and computing the value of merchandise in a retail store, by means of a particular kind of chart.

There are three distinct types of dial faces; namely, the

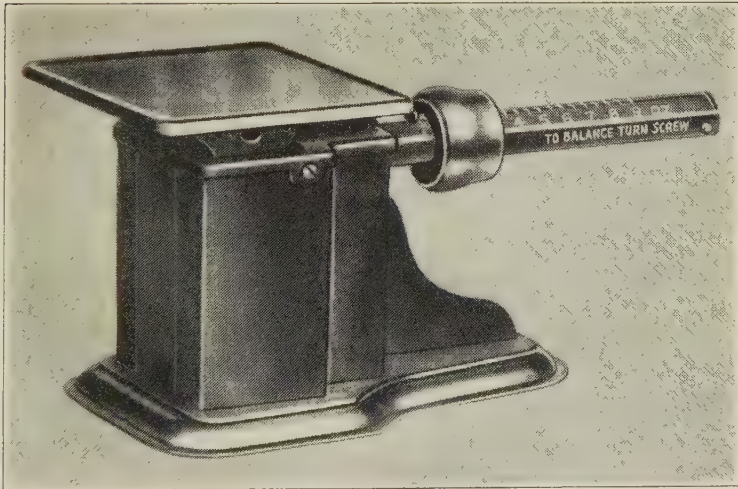


Figure 216: The beam-arm, non-computing postal scale illustrated here is designed for weighing light mail. The letter or package to be weighed is placed on the platform and the poise is set in the ounce-graduated notches. It meets particular requirements for very sensitive weighing up to 9 ounces. See page 502.

cylinder dial, the fan-type dial, and the clock-face dial. As the names indicate, these dials are made in the shape of a cylinder, fan, and clock-face respectively, with stationary or moving charts or indicators showing the postage rates on letters, papers, and miscellaneous matter and merchandise weights.

Illustration A of Figure 214 is equipped with a cylinder dial chart that weighs and computes the postage on parcel-post. Illustration B pictures a parcel-post and mail scale with fan-type dial chart that weighs and computes the postage on both first-class mail and parcel-post. These



Figure 217: For first-class mail and other mailable matter not included in the parcel-post system, the type of postal scale shown above finds a use.

types of scales are made in capacities ranging from 3 pounds up to 25, 50, and 70 pounds fully automatic, as also shown in Figure 215. The positive indicator decides the pound rate postage. Illustration C shows a mail scale with clock-face dial that computes postage for parcel-post mail.

Method of operation in any of the computing postal scales is similar. The parcel is placed on the receiving platter or platform, automatically weighed, and at the same time the postage required is computed. The parcel-post scales compute the postage required from any one zone to any other zone, and weigh the parcel as well. It is only necessary to know the zone in which the receiving point is located in reference to the shipping point, and this information is furnished by the Postal Guide.

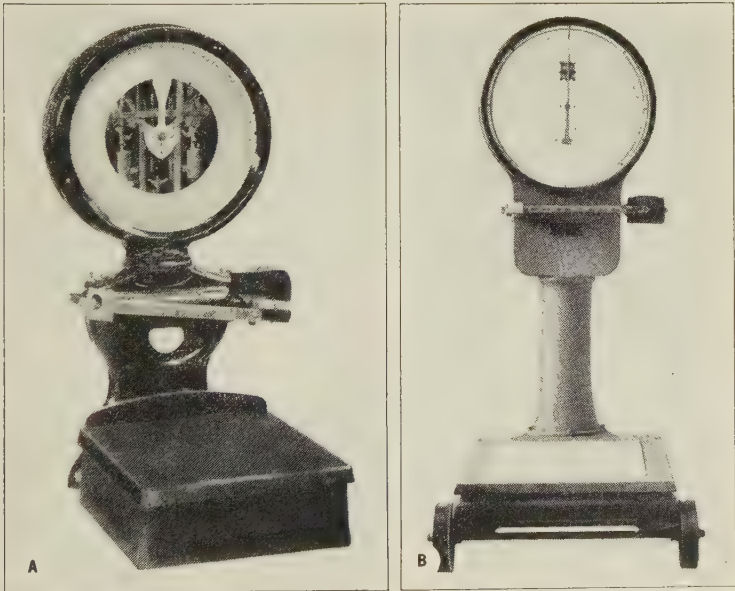


Figure 218: Here are two automatic dial-type scales. Illustration A is used to weigh and compute postage. It can also be used for general weighing. Illustration B shows a general-purpose scale which automatically indicates weight.

The non-automatic computing scale is equipped with a sliding chart which indicates parcel-post rates. Thus, it enables the operator to determine the rates up to the 70-pound limit of parcel-post for all zones. The beam is deeply notched at the pound divisions for quickly determining by hand the desired pound weight. It also weighs by ounces. Illustration D of Figure 214 shows a beam computing postal scale. Notice the sliding chart.

The beam-type parcel-post scale is used for counting as well as weighing. When the scale is adapted for counting, the unit system is used.

Figure 215 shows an automatic parcel-post scale of the fan type, allsteel made, and operated with a double pendulum weight-absorbing system. In capacity this type of scale ranges from 4 to 70 pounds.

*Non-Computing Postal Scales.*¹ The non-computing postal scales for parcel-post work are also used by many businesses. Some of these postal scales that are non-computing have a very small capacity, as low as 9 ounces; however, the beam scale of 9 ounces meets the requirements for very sensitive weighing because it determines within $\frac{1}{2}$ of an ounce whether a letter is over or under the ounce division (see Figures 216 and 217). The beam non-computing postal scales are smaller than the dial-face non-computing postal scales, due to the fact that they are constructed without any dial-face above the platform.

Non-computing postal scales weigh first-, second-, and third-class, parcel-post, and express matter. The object to be weighed is placed on the platform and the weight is shown on the indicator or beam. There is no indication of postage. These scales are especially adapted for quick weighing, as the entire capacity is given on the beam or dial, doing away with loose weights.

Figure 218 pictures two automatic dial-type scales. Il-

¹Manufactured by such companies as Buffalo Scale Company; John Chatillon & Sons; E. and T. Fairbanks and Company; Howe Scale Company; Toledo Scale Company; and Triner Scale & Manufacturing Company.

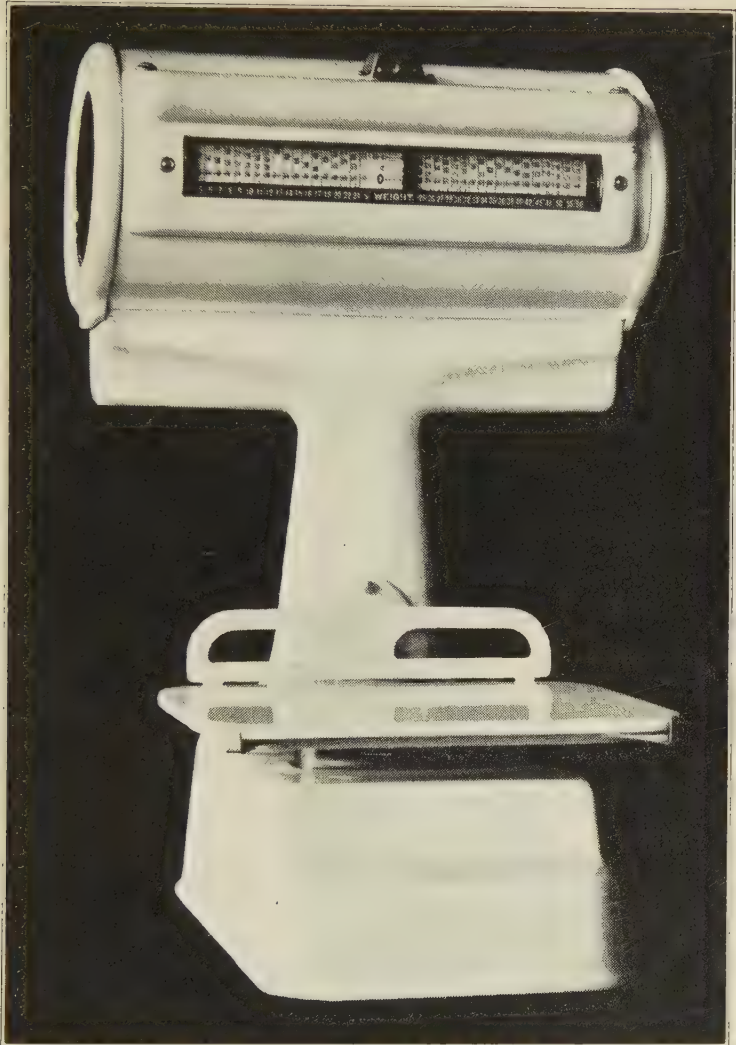


Figure 219: When a computing merchandise scale is used, the buyer is assured that the correct amount will be computed. By means of the double chart the customer is also able to see the weight from the opposite side of the scale (see page 504). Furthermore, the sanitary features of the scale add measurably to its use in a food-products concern.

Illustration A represents the scale which computes postage; it may, however, be used for general weighing, if so desired. When used for parcel-post the pointer indicates the postage required; when used for general weighing it indicates the net weight. Illustration B does not compute the rate of postage but it does automatically indicate the weight. The low platform allows for weighing high parcel-post or express packages.

OTHER SCALES WHICH ADD TO OFFICE EFFICIENCY

In this second category of scales there are two important divisions: first, merchandise scales for retail stores; second, heavy-capacity scales for industrial plants. The first of these two general classes of scales are computing and non-computing; the second—the heavy-capacity scales—are all non-computing, beam and automatic dial types.

*Computing Merchandise Scales.*¹ The modern computing merchandise scale was developed from the old counter computing scale and it was a matter of several years before the present computing merchandise scale was perfected. These scales are equipped with a chart that is similar to the chart on all computing weighing machines and which automatically indicates both weight and computes value when the article is placed on the platter or platform. These scales are built in several sizes and are especially designed for the weighing and computing of values of merchandise in retail stores.

Figure 219 shows one of the many computing merchandise scales in use in retail stores. This scale is equipped with cylinder dial. There are also a number of fan type, and some clock-faced, dial type, merchandise scales.

These computing merchandise scales operate very simply.

¹Manufactured by such companies as Barnes Scale Company; John Chatillon & Sons; Dayton Scale Company division of the International Business Machine Corporation; Standard Computing Scale Company; Stimpson Computing Scale Company; Toledo Scale Company.

The article is placed on the platform and the indicator at once shows on the chart exactly, to a fraction, the amount of the article weighed. Value and weight are shown on the side of the chart that faces the clerk; weight alone on the side that faces the customer.

*Non-Computing Merchandise Scales.*¹ The non-computing merchandise scales are especially designed for heavy mass weighing and render invaluable service for the weighing of commodities in large quantities that often total into thousands of dollars. Non-computing merchandise scales are constructed for the retailer also. Retail concerns find that the non-computing merchandise scale answers certain purposes. The heavy weighing machines serve chiefly in the retail store for weighing incoming stock. Money values in business enterprises which have a need for mass weighing are handled in the accounting department and there is, therefore, no need for a computing weighing machine, but it is of vital importance in the accounting department that the weight figures be correct, since these figures are the basis of calculating costs, interdepartmental records, invoices, and so forth.

The method of operation on all non-automatic, non-computing merchandise scales is the same. The articles to be weighed are placed on the platform and weights are added until the poise assures perfect balance. With the automatic, non-computing scale, however, the article is placed on the platform and the indicator at once points to the weight. There are several types which, though non-computing as to money values, are nevertheless automatic as to weight indication. Figure 220 pictures two non-computing automatic merchandise scales. The hanging balance scale as illustrated by A may use various styles of hanging trays or con-

¹Non-computing merchandise scales are manufactured by such companies as Buffalo Scale Company; John Chatillon & Sons; E. & T. Fairbanks and Company; Hanson Brothers Scale Company; Howe Scale Company; Strait Scale Company; Toledo Scale Company; and Triner Scale & Manufacturing Company.

tainers. A heavy-duty industrial scale which is used for general weighing is shown in illustration B. Figure 221 illustrates a number of non-computing merchandise scales used for various purposes. Illustration A shows a scale which is used by small retailers; illustrations B, C, and D are heavy-capacity scales. The platform type of scale is illustrated by B. Illustration C shows one make of counter or bench scale, while illustration D depicts an industrial railway scale.

Heavy-Capacity Scales. These may be divided into two general classes: beam scales and automatic dial scales. Each of these general types may be subdivided into several kinds, such as, portable, dormant, tank, overhead track or mono-rail, suspended platform, auto-truck, and railroad track scales. They are variously used, especially the automatic models, not only for weighing, but also for counting, testing, and for many special processes.

As in the case of merchandising scales, the weighing

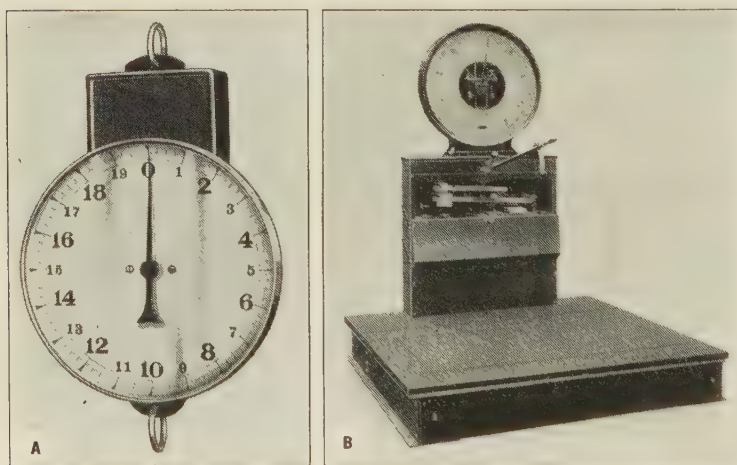


Figure 220: Two different kinds of non-computing automatic merchandise scales are shown here. Illustration A is a hanging balance scale. Various styles of hanging trays may be hooked into the ring. Illustration B is a heavy-duty industrial scale which is used for general weighing.

devices used in the manufacturing departments, both heavy-capacity and the smaller bench scales, contribute to office efficiency, inasmuch as the figures determined by these scales in the measurement of materials and products on receipt or delivery, in interdepartmental transactions, in the matter of compliance with specification, enter into the calculation of costs, production, profits, invoices, and so forth. It is important from a standpoint of accounting, as well as manufacturing, that the scales be accurate, dependable, and adapted to the purposes for which they are used, otherwise there will be errors in the basic figures which will be perpetuated in the accounting records.

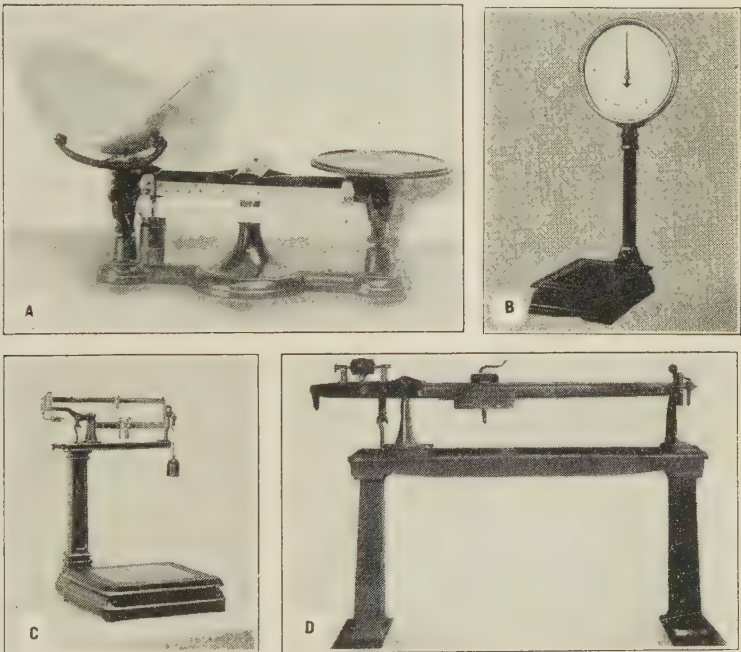


Figure 221: Non-computing merchandise scales are made in many styles. Here are a few examples: illustration A, used in retail stores; illustration B, in packing houses for weighing bulky commodities; illustration C, for counter or bench weighing; illustration D, the beam-arm of a heavy-weight, industrial railway scale. See pages 505 and 506 for full details.

Not only the factory superintendent, but also the financial management of the business, is therefore interested in the character of the scales used in the manufacturing departments. It is readily seen that these scales must be exceedingly accurate and of such sturdy construction and skilled engineering as to withstand wear and maintain this accuracy in spite of heavy loads and hard usage. They need also to be simple in operation, because of the lack of training in the use of figures on the part of the men by whom the weighing usually is done. In many industrial plants the weighing operations are regarded as of such importance as to require a weighman with clerical experience. In such places every convenience is afforded to enable the weighman to keep an accurate record of the weight figures. In some cases, for convenience of operation, the main elements of these heavy-capacity scales—the platform and the large levers—are located in the yard or factory, and the dial beam, or indicating part of the scale, is built within the confines of the adjacent office itself.

THE IMPORTANCE OF THE SCALE IN BUSINESS

The retail store, the wholesale house, and the factory benefit alike by the operation of these mechanical weighing devices. It is, however, the lay public that the weighing machine serves best and to whom it saves hundreds of thousands of dollars each year. This is accomplished through the great Postal System of the United States, which daily transmits the mail and parcels of America's millions of people. By the use of mail, parcel-post, and express scales the government is protected from the danger of understamping and the public from that of overstamping.

In individual business enterprises, too, overstamping is an item that means much unnecessary expense which should be guarded with care and with the highest type of mechanical devices obtainable. Perhaps one can gain a definite idea of just what this expense is by remembering that the wast-

ing of just one 2-cent stamp a day amounts to \$6 in the course of a year. Multiplying this by the scores or hundreds of waste stamps daily is perhaps the best recommendation for the introduction of a postal weighing machine. The general tendency where these machines are not used is either to overstamp or understamp. The first-mentioned practice means unnecessary expense, and the second may have even more serious consequences. It frequently results in the loss of good-will of the customer or of those whom the sender desires to become a customer.

The heavy-capacity scales that weigh huge quantities of commodities can justly be given credit for saving thousands of dollars to the industries where they are used. The bulk and the value of the loads are so great that the time of weighing is of minor importance in comparison with the value of the accuracy resulting. There is no substitute that can be recommended for these scales in this particular field and it is certain that those who have used them in this capacity have no intention of changing.

XXIX

TIME-RECORDING DEVICES

Time control the basis of efficiency. Early experiments with time recorders. Features common to all time-recording devices: method of operation; imprint. A recorder for every purpose. Employees' time recorders: card recorders; dial recorders; autographic recorders. Time stamps: electric models; spring-wound models. Job-time recorders. Elapsed-time recorders. Money-time recorders. Recording door locks. Watchman's recording equipment: electric watchclocks; portable watchclocks. Program instruments. Service rendered by time recorders.

FORTY or fifty years ago the majority of manufacturers had no conception of the proper control of time and did not realize its dollars-and-cents value. It is true that manufacturing plants were much smaller than the average today, and that wages, compared with those of today, were relatively low; but the only kind of control, most often, was that exercised directly by the superintendent or the owner himself. Employees were few and the management was close to conditions.

Gradually, however, systems of time control were introduced and improved from year to year. At first, as a means of controlling attendance some employers locked a gate at starting time. Brass checks and other means were used to identify employees and keep track of their time. The men were paid almost wholly by the hour, the day, or the week.

Time clocks were sometimes located at the gate so that they might record the time when the men entered. Their pay began from the time they punched the clock. Only in isolated cases were recorders located in each department, to register the time the employee actually began to produce. As long as he was in the plant, that was all the manufacturer cared about.

The amount of time put in on each job was a matter of extreme uncertainty. It was seldom obtained. And even when it was, it was left up to each employee. He filled in a time-card by hand, usually in pencil at the end of the day, and "estimated" how his time had been spent. On these wild guesses by employees the manufacturer determined the labor cost chargeable to the jobs they worked on.

The general feeling among the plant managers in those days was that clocks should be kept out of sight. They feared that the men would waste too much time in watching them.

Scientific management was unknown. The control of labor to insure maximum production was lax. Wage incentive methods, such as piece-work and various forms of premium and bonus, were almost unknown. The idea of closely scrutinizing various elements, such as overhead expense, and particularly non-productive time, did not exist as it does today. There were no planning departments to insure orderly procedure in production. A vast amount of non-productive time, caused by delays and other factors, was the result.

Service to customers in answering correspondence and in filling orders was sadly neglected. Few firms "bothered" to time-stamp their mail and other papers and records. The accuracy of the starting and stopping time in the plant depended upon whether the engineer had a "good" or a "bad" watch. He blew the whistle in accordance with his watch. The whistle-time was usually in variance with the actual time and with the time of the various clocks and time devices throughout the plant.

This is a brief outline of manufacturing conditions as they existed 40 to 50 years ago. Naturally there was much general looseness, uncertainty, and actual money loss.

With the growth of industry came a realization of the urgent need of a means of accurately controlling the time element. For the first time it was understood that the time element affects every phase of a business, that time is

actually money, and that if losses are to be prevented and profits made, time must be measured and controlled the same as money and materials.

Manufacturers saw with a jolt that while they were using the utmost care in scrutinizing—weighing, measuring, and testing—every factor in their business for which they paid out their good money, they were overlooking the element of time. They were paying out their good money for time without checking or measuring, buying it and paying for it by the wildest guesswork.

To meet this need for checking up on time, various types of key-wound clocks and time-recording devices were de-

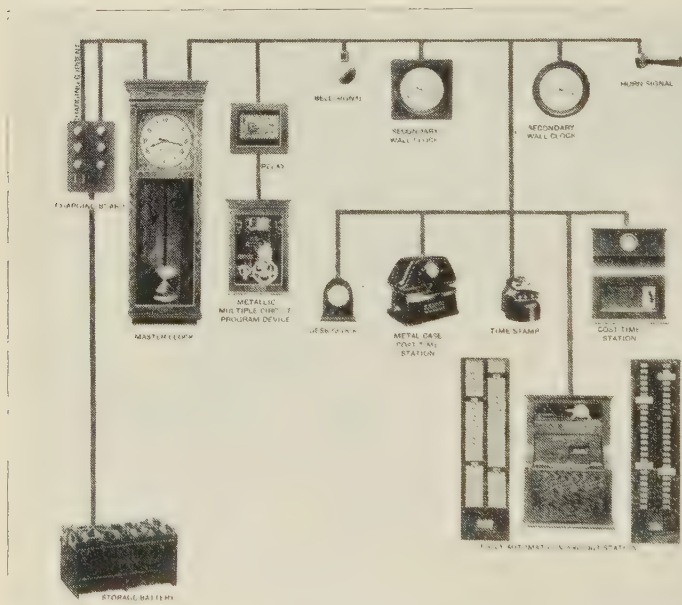


Figure 222: A means of securing uniform and accurate time throughout an organization is provided by an electric time system. As indicated above, a master clock sends an impulse each minute to every unit in the system. There is no limit to the number of devices that can be operated by one master-clock; additional units can be added or the number reduced at will.

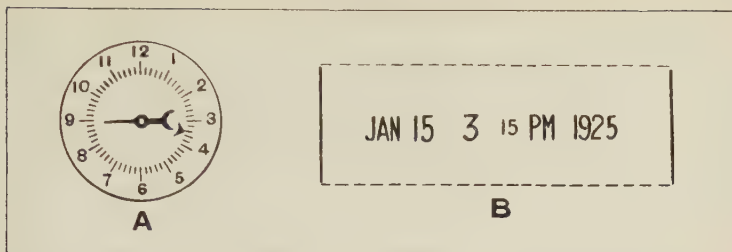


Figure 223: Some time-recording devices make a dial impression like that reproduced in A, above. The other style, illustrated in B, shows the time in a single line. In addition, other information, such as the user's name or department, can be imprinted with either style, as explained on page 518.

veloped. They were operated by a clock or watch mechanism which was contained in the time device.

EARLY EXPERIMENTS WITH TIME RECORDERS

One of the first to experiment with a device for recording time was John C. Wilson who, over 50 years ago, realized the impracticability of handwritten records and conceived the idea of what later developed into a time stamp. Faith in his idea led to tireless experiments, developments, and patents which date back to the year 1871. It was his problem to imprint or stamp the clock face at any desired time, retaining a dependable, accurate, and unchangeable record of that time without disturbing the free running of the clock. The first device contained a Seth Thomas clock as does the present-day model. It consisted of a block foundation supporting brass disks and printing indicators. A ribbon was part of the removal unit which covered the printing. An indexed word cylinder provided for the printing of such words as "Received," "Answered," together with other records.¹

The original device for recording employees' time was the Bundy Key Recorder. This machine, developed in 1888

¹The Automatic Time Stamp Company was founded in 1880.

No. 98							
NAME HENRY MILLER.							
APR 25 1925 PAY ENDING							
MON	TUE	WED	THU	FRI	SAT	SUN	
Σ 7 30	Σ 7 36	Σ 7 23	Σ 7 30	Σ 7 40	Σ 7 29		
Σ 12 1	Σ 12 00	Σ 12 4	Σ 12 1	Σ 12 2	Σ 11 45		
Σ 12 28	Σ 12 26	Σ 12 29	Σ 12 16	Σ 12 40			
Σ 4 49	Σ 4 47	Σ 4 50	Σ 4 45	Σ 4 48			
	Σ 5 15			Σ 5 14			
	Σ 8 17			Σ 8 18			
8 74 0/10 3 5 4 9 90 1/4 3 4 4 REGULAR TIME 5/24 HRS. RATE 51 = 27.41 OVERTIME 6 87 = 5.22 TOTAL AMOUNT 32.63							

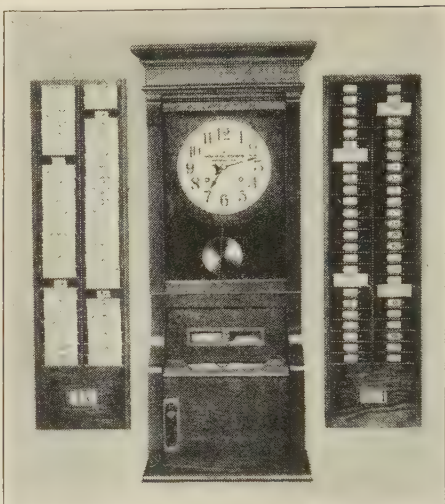


Figure 224: Attendance time recorders promote discipline and the full-time habit; they reduce clerical labor by eliminating the keeping and transcribing of pay-roll records. Card recorders are designed to imprint time on individual cards shown here. The operation of this type of recorder is explained on page 519.

by W. L. Bundy at Auburn, New York, marked the beginning of the important progress of this particular form of time recorders.

When a key was inserted in the machine, the workman's number was printed, together with the impression of the clock-driven type wheels which showed the hour and minute of registration.¹

A patent was granted to E. S. Phelps in 1892 on the first recording door lock.²

After these early inventions, business took long strides forward in cost accounting, piece-work, and bonus systems, so that the need for other devices in time-recording service impressed itself upon the executives. This resulted in the

¹The Bundy Manufacturing Company, organized in 1888, was taken over in 1901 by the International Time Recording Company.

²This device was manufactured by the Phelps Guardant Time Lock Company.

invention and manufacture of job-time recorders and, later, elapsed-time and cost recorders which have given cost and accounting departments reliable time records upon which to base their reports and recommendations.

FEATURES COMMON TO TIME-RECORDING DEVICES

All instruments which record time may be said to share two common features or characteristics. They are, first, the method of operation; second, the style imprints. Briefly, these may be explained as follows:

Method of Operation. According to operation there are two kinds of time recorders: mechanical and electrical. The mechanical, or spring-driven devices are operated

PMT PERIOD ENDING							
No. 220				Oct. 31-1923			
NAME PAUL GREEN							
You are your own Timekeeper. We pay by this record, your own recording.							
Date	IN	OUT	IN	OUT	IN	OUT	Total
10/1							9
10/2	7:01						8 1/2
10/3							9
10/4			12:35				8 1/2
10/5							5
10/6							9
10/7							9
10/8					5:30	9:30	13
10/9							9
10/10							9
10/11							9
10/12							5
10/13							9
10/14							9
10/15							5
10/16							9
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10/93							9
10/94							9
10/95							9
10/96							9
10/97							9
10/98							9
10/99							9
10/100							9

REGULAR HRS. 119 1/4 RATE 60 REGULAR PAY 70 35
OVERTIME HRS. 4 RATE 90 OVERTIME PAY 3 60
TOTAL HRS. 123 1/4 TOTAL PAY 73 95

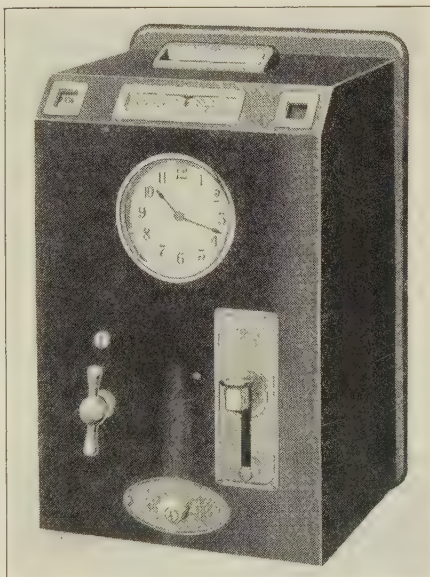
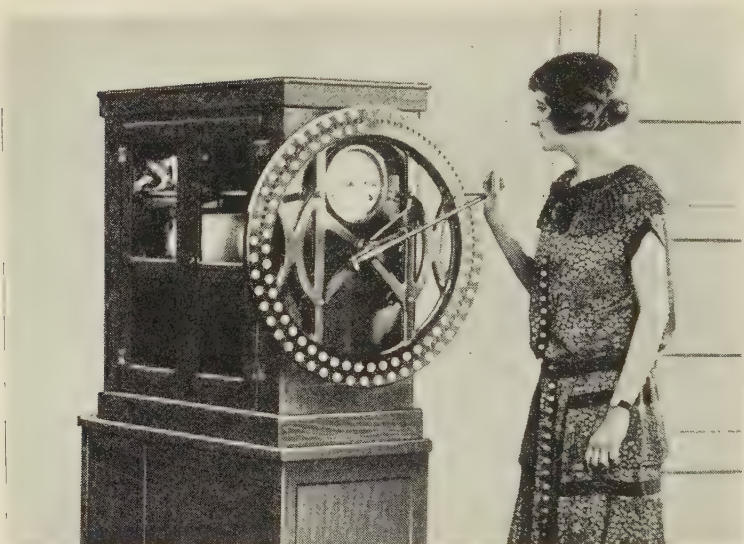


Figure 225: With a time recorder placed in your office or plant each employee becomes his own timekeeper, and his record is exact. Many varieties of cards to fit any conditions may be used with the type of device that records the time employees arrive and depart. The three types of recorders are described on page 518.



NAMES	PAY ROLL WEEK		Total Time	Rate	Amount Due
<i>Geo Bacon</i>			1 49	65	31.95
<i>Mrs Baker</i>			2 48	60	29.10
<i>E. A. Pope</i>			3 50	57	28.00
<i>J. C. Conner</i>			4 48	57	28.20
<i>G. C. Eldridge</i>			5 49	55	26.95
<i>G. J. Thinsor</i>			6 50	60	30.00
<i>Chas. Bove</i>			7 46	65	29.25
<i>Gray Root</i>			8 50	70	35.00
<i>Frank Monroe</i>			9 50	63	31.50
<i>Egal Buty</i>			10 50	65	32.50
<i>E. Higgins</i>			30 47	60	29.40
<i>R. E. Barr</i>			31 48	68	31.20
<i>F. Davis</i>			32 50	63	31.50
<i>A. E. Mead</i>			33 49	57	28.91
<i>A. J. Jordan</i>			34 47	70	32.70
<i>R. O. Bayler</i>			35 48	66	31.68
<i>W. L. Clark</i>			36 50	65	32.50
<i>O. E. Dwyer</i>			37 48	60	28.80
<i>E. W. White</i>			38 49	70	34.30
<i>E. A. Stowell</i>			39 47	68	31.96
<i>J. N. Buty</i>			40 50	65	32.50
TOTAL			447		1,534.20

Figure 226: Another kind of attendance recorder is the dial recorder, described on page 519, which prints a complete time or time and pay-roll record on a sheet locked within the machine. A section of a weekly pay-roll sheet is reproduced above. Irregular time is printed in red. The sheets can be filed for future reference.

simply by means of a clock mechanism which they contain, and are wound by hand. The electrically driven machines are controlled by a master-clock from which any number of other electrical time-recording devices may be operated in unison (see Figure 222). The recording principle is the same as that used in the spring-wound devices. Equipment on these electric time systems is operated either from commercial current or storage batteries. The electric current passes from the battery or commercial current to the master-clock which sends an impulse to every recording unit in the system once every minute. There is no limit to the number of units which can be controlled by a master-clock. Secondary clocks are used to tell the time in the various departments, offices and rooms.

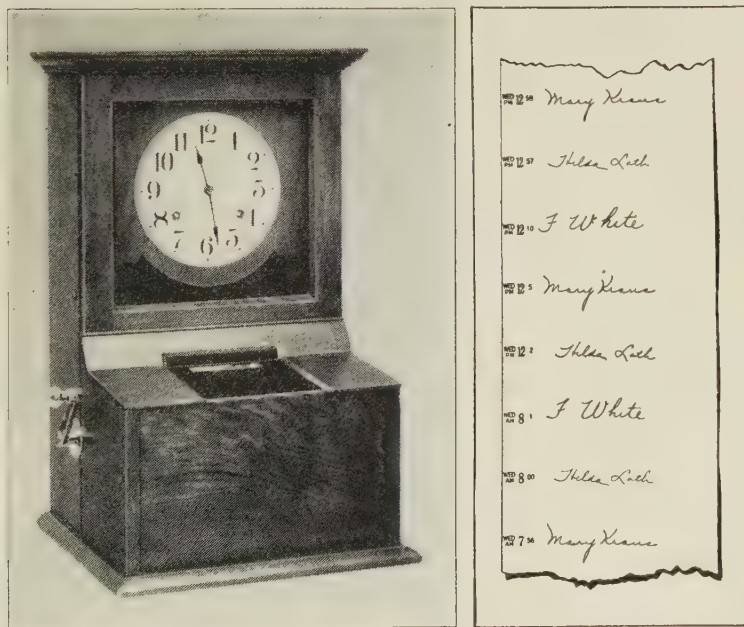


Figure 227: Autographic attendance records print a record of the arrival and departure of all employees on a paper strip within the machine. Notice above, that each employee signs his name opposite his printed time record. A discussion of the several types of attendance recorders begins on page 518.

Imprint. Figure 223 shows the two styles of imprints made by time recorders. A of this figure is known as the clock dial. The time is indicated by means of a printed clock face, a minute hand, and an hour hand. The imprint shown in B of this figure is known as the one-line imprint. It shows, in one line, the month, the day of the month, the hour, the minute, whether morning or afternoon, and the year. The illustration shows simple forms of imprints. The recorder can be equipped to print other data—such as the name of a department—in connection with the typical imprints shown in this illustration. Some door locks and watchman's clocks make a record on a chart by means of a pencil and stylus or embossing dies.

A RECORDER FOR EVERY PURPOSE

Each type of time recorder on the market has been designed for a specific purpose. It is, therefore, according to the functions which they serve that the various kinds of recorders are discussed in the following paragraphs. The amount of detail varies with the importance of the type of recorder and with what is essential in order to explain clearly its various operations.

EMPLOYEES' TIME RECORDERS

Employees' time recorders are used for recording the arrival and departure of employees. They are manufactured in three different styles: card, dial, and autographic.

*Card Recorders.*¹ When this style of recorder is used, each employee's time record is printed on a separate card. The machines are adjusted, either by hand or automatically, to print in certain "In" and "Out" columns, designated for

¹Manufactured by such companies as The Automatic Time Stamp Company; The Cincinnati Time Recorder Company; Follett Time Recording Company; International Time Recording Company; Simplex Time Recorder Company; Stromberg Electric Company.

starting time, lunch time, quitting time, and overtime. (See Figures 224 and 225.)

The cards are kept in racks on either side of the recorder, as shown in Figure 224. The records may be printed in daily, weekly, biweekly forms, and may be printed in either horizontal spaces or vertical columns. Late arrivals, early departures, or overtime are printed in red on some models; others provide certain spaces for irregular time.

A broad variety of time record cards to take care of any pay-roll period can be furnished for use with the recorders.

The method of operation is simple. As the employee enters, he removes his card from the "Out" rack, inserts it in the receiver of the recorder, and makes his record by pushing down a thumb piece or lever. He then passes on to the "In" rack where he deposits his card in the proper space, according to its number. The cards remaining in the "Out" racks indicate that the employees represented by those cards are absent. As the employee leaves, he removes his card from the "In" rack, registers, and deposits his card in the "Out" rack. This may be repeated as often as the employee arrives and departs, the cards being so arranged as to provide sufficient space for frequent registrations. The cards in the "In" rack indicate that the employees represented by those cards are present.

A variation from the general type is the device which records the arrival and departure of employees and in addition the starting and finishing of job work.

*Dial Recorders.*¹ Instead of printing on cards, dial recorders (see Figure 226) print a complete time or time and pay-roll record on a sheet locked in the machine. The sheet may be removed at will by authorized persons or inspected at any time through the glass doors of the recorder. Irregular time is printed in red.

Records for as many as 150 employees can be handled by machines of this type. Daily slips or weekly records can

¹These devices are made by such companies as The E. Howard Clock Company; and International Time Recording Company.

be furnished to accommodate either 6 to 12 "In" and "Out" registrations or 6 registrations for each employee for 7 days. In columns at the right of the weekly sheets pay-roll computations can be made.

To record his time the employee swings the registering arm to the position opposite his name in the proper "In" or "Out" column.

Both spring-wound models or electric models controlled from the master-clock of an electric time-recording system are available.

*Autographic Recorders.*¹ Like dial recorders, autographic recorders print the time record of all employees on a sheet within the machine. In addition, each employee signs his name opposite his time record on a paper tape inside the machine. Thus, individual proof is afforded in each case. (Figure 227.)

TIME STAMPS

Figures 228 and 229 represent two of the three types of time stamps used for registering the time of receipt, delivery, or handling of mail, telegrams, reports, or other documents.

*Electric Models.*² Time stamps controlled from a master-clock (Figure 228) make a one-line imprint showing the hour, minute, day, month, and year. The time may be printed in hours, tenths of hour, or hundredths of hour. The name of the company, department, or other data, such as sent and received, may be printed above or below the date line.

To make an imprint it is only necessary to bring the head down upon the paper which has been placed beneath it. The

¹Autographic recorders are made by such companies as The Cincinnati Time Recorder Company; The E. Howard Clock Company; and International Time Recording Company.

²Such companies as The Cincinnati Time Recorder Company; International Time Recording Company; Stromberg Electric Company make time stamps of this class.

stamp changes automatically the date, hour, minute, and meridian and, if necessary, the machine can be arranged to record the seconds or any subdivisions of the hour. One stamp automatically sets the dates for long and short months even to February of leap year, when it prints 29 days.

One electrically operated time stamp is automatic in operation, and requires no master-clock or special wiring. It prints a dial-type record.

*Spring-Wound Models.*¹ Other time stamps are clock-driven and make a dial style of imprint (Figure 229) recording the hour and minute, the day, month, and year. Also, the name of the company, the department, or other information may be printed.

The hour and minute printing hands and the "a.m." and "p.m." hand or time indicators of the particular model illustrated are directly connected with a clock which continuously drives or revolves them inside a stationary hour and minute printing clock dial in the same way the hands of a clock move over its face. At noon and midnight the clock automatically changes the position of the "a.m." and the "p.m." printing indicators. Around the outer edge of the brass dial the name and address of the owner of the stamp can be engraved. Above the dial die is the revolving or selective word-printing cylinder, and, below the dial the date-printing wheels. An inked ribbon is part of this unit. Spaces are provided for eight different words and their indexes in the word cylinder.

A clock and a rubber die in a frame similar to a rubber hand stamp constitute time stamps of another type. A felt ink pad in the base furnishes the ink supply. The operation is similar to that of a rubber stamp. Time is indicated by a clock-dial imprint with which the name of the company department or other words may be combined.²

¹This type of time stamp is made by such companies as the Ajax Time Stamp Company; The Automatic Time Stamp Company; Follett Time Recording Company; International Time Recording Company.

²Manufactured by such companies as the A. D. Joslin Manufacturing Company; The Ellis Time Stamp Company.

JOB-TIME RECORDERS¹

These instruments print records of the time spent on jobs or operations in hours and minutes, hours and tenths or hundredths, and periods, as well as the day of the week or the day of the month. The tenth-hour period avoids all fractions and cumbersome calculations by placing the entire system on a decimal basis. The records made are especially designed to furnish records of time in such form that the time used can be quickly and conveniently calculated. From these records the value of time in dollars and cents is calculated and thus the actual cost of labor on each job is accurately determined. Devices of this sort are manufactured in both self-contained spring-driven and electrically driven models.

Electric models (Figure 230) are placed about the building where most handy and controlled from a central clock. Each recorder contains a set of number-printing wheels for stamping the date and hour on the time ticket. All non-working time, such as noon, night, or any other interval when the factory is not running, is automatically cut out by the controlling clock. When any or all departments are worked overtime, the device shows distinctive records of such times without interfering with the accumulation of regular time during the day. The same equipment may be used for both day and night forces or for three eight-hour shifts.

Job-time recorders are adaptable where the plan of numbering the working hours conforms with working schedules instead of time of day.

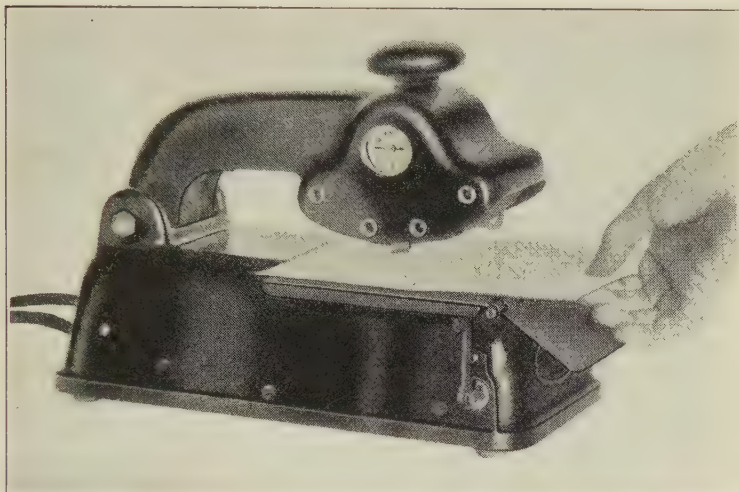
The designations "a.m." and "p.m." are usually eliminated, and Continental time—1 to 24 o'clock—is used to simplify subtractions.

For example, suppose that the working schedule is from 7 a.m. until 12 a.m. and from 1 p.m. until 4 p.m. At 7 a.m.

¹Manufactured by such companies as The Cincinnati Time Recorder Company; Follett Time Recording Company; International Time Recording Company; Gisholt Machine Company; Stromberg Electric Company.

the recorder will print 0. At 12 o'clock noon it will print 5. If the noon hour is to be eliminated as a non-working hour, the machine can be so adjusted, in which case it will print 5 again at 1 p.m. At 4 p.m. it will print 8.

The working schedule begins at zero regardless of what



RECEIVED
BLAIR & CO. INC.
CABLE DEPT.

FEB 17 9 48 AM -23

24 BROAD ST.
NEW YORK

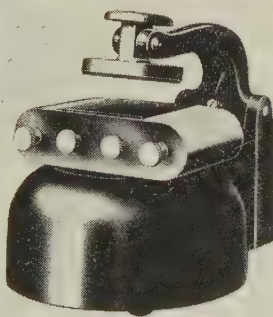


Figure 228: Because it produces an accurate record of the receipt or distribution of mail, orders, and important papers, the time stamp is indispensable in the modern office. Above are shown electrically operated models, controlled by master-clocks. Incidental lettering appears in connection with the time registration, as indicated by the specimen impression. See page 520.



Figure 220: This time stamp differs from that pictured in Figure 228 in that it is controlled by a self-contained clock. Notice that it makes the clock-dial style of imprint with the necessary inscription around it. On page 520 you will find a description of the several interesting kinds of time stamps now on the market.



8	DATE <u>Feb 4/25</u>
	WORKMAN <u>A. Andrews</u>
	JOB NO. <u>1174</u>
	OPERATION <u>Grind Valves</u>
STOP FEB 4 5:58 START FEB 4 1:12 TIME ON JOB <u>4.46</u>	

Figure 230: Applying economy to time and cost systems means securing the necessary information and records at lowest possible cost. Job-time recorders, used for printing the records of time spent on jobs or operations, effect such savings and fit into any cost system. Page 522 explains, also, how they insure a square deal to employees.

time it starts. Thus the job record shows the number of working hours and fractions of working hours. The job ticket shown in Figure 230 illustrates the method of indicating the number of working hours spent on a job. The workman, A. Andrews, started on Job 1174, operation Grind Valves, February 4, at 1:12, and stopped work on this particular job at 5:58. The time that he spent on this job was therefore 4.46 hours.

ELAPSED-TIME RECORDERS¹

Besides printing the starting and stopping time of a job or operation as the job-time recorders do, elapsed-time recorders calculate and print the elapsed time, thus doing away with the necessity of subtracting the starting from the finishing time. Such devices are used by both day- and piece-workers or can be operated by a shop clerk. When

¹Manufactured by such companies as Calculagraph Company; International Time Recording Company; Stromberg Electric Company.

used to record departmental time, the recorder is mounted in a location most convenient to all the workmen. It may be placed in the charge of the cost clerk or the foreman or his assistant, and will compute and print the elapsed time

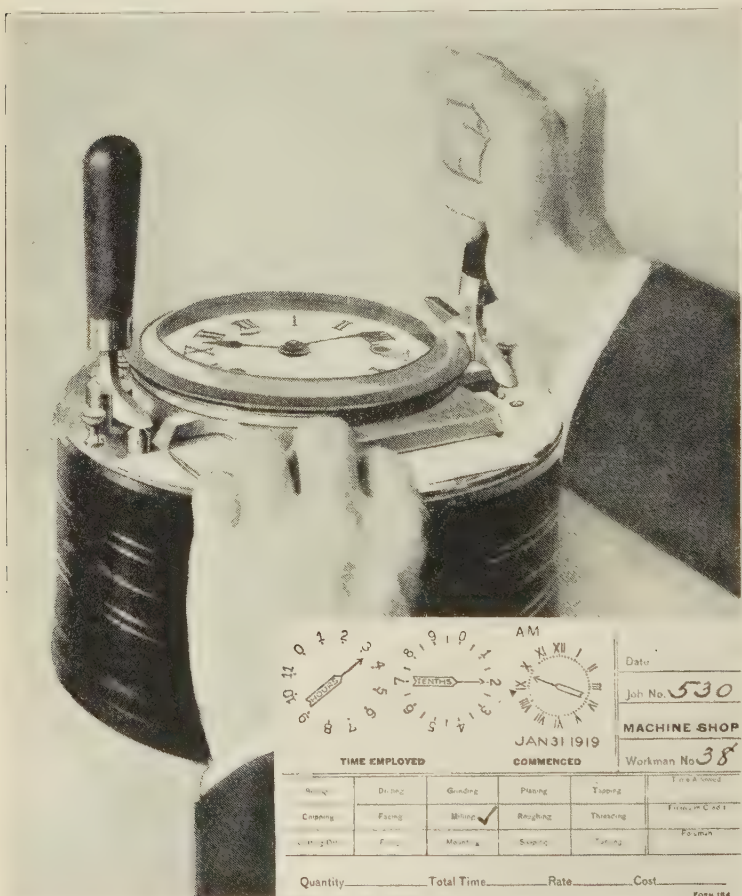


Figure 231: Intensive manufacturing makes accurate cost data that are promptly available a prime necessity. The actual time spent by each workman on each task gives a true record of costs by which the manufacturer can fix his selling prices or know the margin of profit and loss. Interesting devices which calculate and print the time spent on a job are an aid to securing such cost records. See page 527 and 528.

for any number of workmen engaged in any number of jobs, irrespective of the order of starting and ending times. When the foreman assigns a job to a workman, a card is issued bearing the workman's name or number, the job number, and any other information required. When detailed costs are kept, the operations may be printed on the time ticket and a checkmark made after each operation instead of writing it down.

The card is placed in the machine (see Figure 231) face down and the right handle pulled. It is then filed in a rack under the workman's number. When the workman has finished the job, the card is again inserted in the machine and the left handle operated. The complete record will show the starting time of the job, the date, and the actual elapsed time spent upon the work. Then the workman is given another card for his next job. At the end of the day or at any other convenient time the elapsed time of every workman is totaled and checked with the pay-roll time. The value of each workman's record is then extended. An adding machine may be used to list the amounts, and only the totals need be transferred to the individual job account.

By reassorting the cards, a single set of records may be used for a number of different purposes, such as, for instance, labor costs of production, making up the pay-roll, productive and non-productive hours, machine time, efficiency records, and data for piece prices. All of these results are obtainable without copying the figures from each separate card.

One device times the length of a process and prevents the process from running for too short or too long a time. This instrument indicates the total length of the process, and the length the process has been in operation; it also shows how much longer the process is to continue, and signals, by means of a bell or a light, the completion of the process. This device is attached to a wall or post within reasonable

reach of the operator handling the process and convenient for his observation.

MONEY-TIME RECORDERS¹

This type of recorder not only prints the elapsed time spent on jobs or operations, but computes and prints in dollars and cents the money value of this time, according to the pay of the worker; computes and prints the burden or overhead to be applied against the job; computes the overhead charge in dollars and cents and prints the employee's number. Figure 232 shows a money-time recorder in operation.

RECORDING DOOR LOCKS²

Recording door locks are designed to protect the business against losses incurred by late openings and early closings and to guard against unauthorized entries after working hours.

Some locks are sold outright; others are available on a lease basis.

Most all the locks on the market have a self-contained clock movement, and a turn of the key in the lock makes the record on a paper tape or dial inside the lock itself. One device contains no clock mechanism but is controlled by and makes its record on a master recorder located in a central place. In all cases, the secret record is accessible only to the owner or other authorized person who holds the key to the recording mechanism.

Some recorders show the day, hour, minute (a.m. or p.m.) that the lock was turned. Others show, in addition, whether the door was opened or closed from the inside or outside and by whom the key was turned.

¹Made by such companies as International Time Recording Company.

²Manufactured by such companies as the International Time Recording Company; Phelps Guardant Time Lock Company; The Recording Devices Company; The Silent Watchman Corporation.

Each lock is furnished with several keys. In some cases each key prints its own identity.

The records kept by the several locks on the market are interestingly different.

A turn of the key in one lock prints the time on the autographic recorder with which it is used (Figure 233). Opposite his registration each employee signs his name.

Another recorder of this same make, also controlled by a master-clock, records the time in printed figures on a paper tape contained in the lock itself. The door on which this lock is installed cannot be opened until all other doors, windows, and skylights in the building have been bolted. The watchman may record his time without unlocking the door (Figure 234).

A sensitized paper dial contained in the lock pictured in Figure 235 receives the record made by a steel stylus when

DEPT 4		DATE Apr. 24, 1924	
T. List		Machine No.	
1	1213	1	1213
2	1214	2	1214
3	1215	3	1215
4	1216	4	1216
5	1217	5	1217
6	1218	6	1218
7	1219	7	1219
8	1220	8	1220
9	1221	9	1221
10	1222	10	1222
11	1223	11	1223
12	1224	12	1224
Order No.		Part No.	
1225		1225	
1226		1226	
1227		1227	
1228		1228	
1229		1229	
1230		1230	
1231		1231	
1232		1232	
1233		1233	
1234		1234	
1235		1235	
1236		1236	
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1320		1320	
1321		1321	
1322		1322	
1323		1323	
1324		1324	
1325		1325	
1326		1326	
1327		1327	
1328		1328	
1329		1329	
1330		1330	



Figure 232: On page 528 is given a description of another aid to accurate cost figures, the money-time recorder, which prints the elapsed time spent on jobs and also computes and prints in dollars and cents the value of the time according to the pay of the worker.

an employee turns his key. The dial, graduated into ten-minute, half-hour, and hour divisions, records the time for a week. Notice on the reproduced record that there is an arc for each day of the week and that an outward break in the circle represents the locking and an inward break the unlocking of the door.

Under some conditions a blank dial, instead of the graduated dial referred to above, is used with this lock, and the time record is obtained by reading the arc record on this blank dial through a transparency designed for this purpose. It may be desirable, for example, to use the blank dial equipment in a lock guarding a branch store or office. Some person in the branch puts in and takes out the dial records and sends the completed records to headquarters. Any tampering shows when the arc records are interpreted.

A lock which imprints the record in a clock-dial design

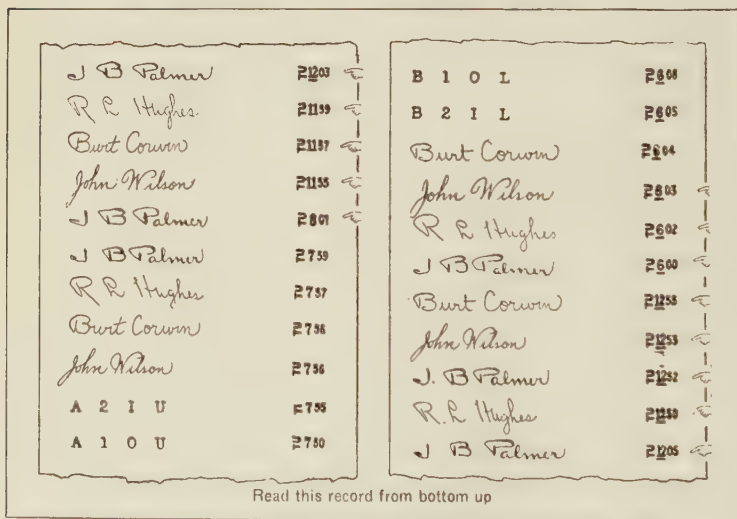


Figure 233: Recording door locks give a complete history of the opening and closing of doors. Several distinct styles are described on pages 529-531. Above is shown a record made on what is known as the autograph type of recorder—that is, each employee signs his name opposite his registration, thereby eliminating the possibility of dispute.

on a continuous paper tape inside the device appears in Figure 236. It, too, is controlled by a self-contained clock. Each key has its distinguishing characteristic to identify its possessor's record on the tape.

Another lock contains a stylus or pencil which makes a mark on the rotating chart when a key is turned. An eight-day record is provided by this chart. While the door is locked a horizontal line is drawn. The door cannot be locked by any other lock until a record is made. Likewise, it is impossible to make a record of opening until all other locks on the door have been unlocked. (See Figure 237.)

WATCHMAN'S RECORDING EQUIPMENT

Only by a mechanical check on his visits to desired points

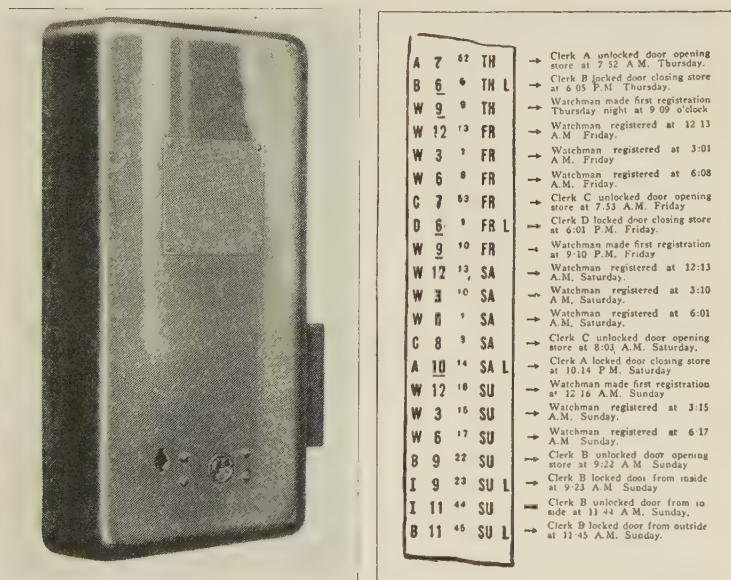


Figure 234: Some recording door locks print the time of opening and closing on a paper strip inside the lock itself. The record reproduced above is self-explanatory. The several kinds of locks on the market which offer protection where it is needed are interestingly different, as will be learned from reading the description which begins on page 528.

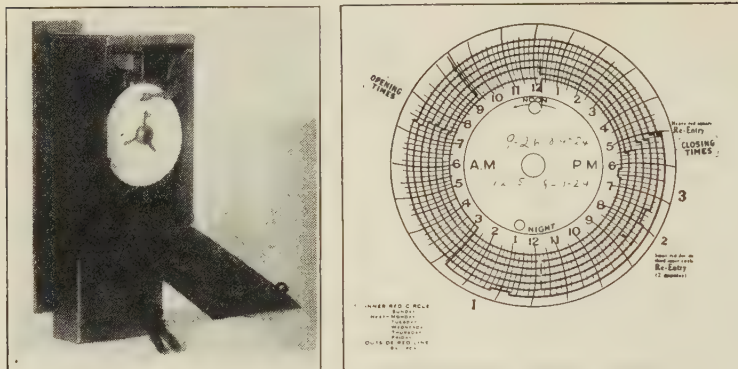


Figure 235: A turn of a key in this lock makes a record on a sensitized paper dial. Notice that there is an arc for each day of the week and that an outward break in the circle represents the locking, and an inward break, the unlocking, of the door. This is explained in detail on pages 529-530.

throughout the premises to be covered during his rounds can you be sure that your watchman is guarding your plant every minute. Watchman's recording systems provide an impartial, indisputable record of every man's fulfilment of duty or exposes him if he fails to execute orders.

In some cases the record is printed in one line. Other systems give a record made on a paper chart—either rectangular or circular.

For convenience, this equipment will be considered under two headings—electric watchclocks and portable watchclocks.

*Electric Watchclocks.*¹ Some watchman's station equipment is a part of an electric time system used in the building or plant and is controlled by a master-clock the same as time stamps, attendance time recorders, recording door locks, and other devices previously described.

Stations are placed throughout the plant and a turn of the watchman's key—each one has his own key—in the lock causes his record to be made on a master recorder located in

¹Made by such companies as The E. Howard Clock Company; International Time Recording Company; and Stromberg Electric Company.

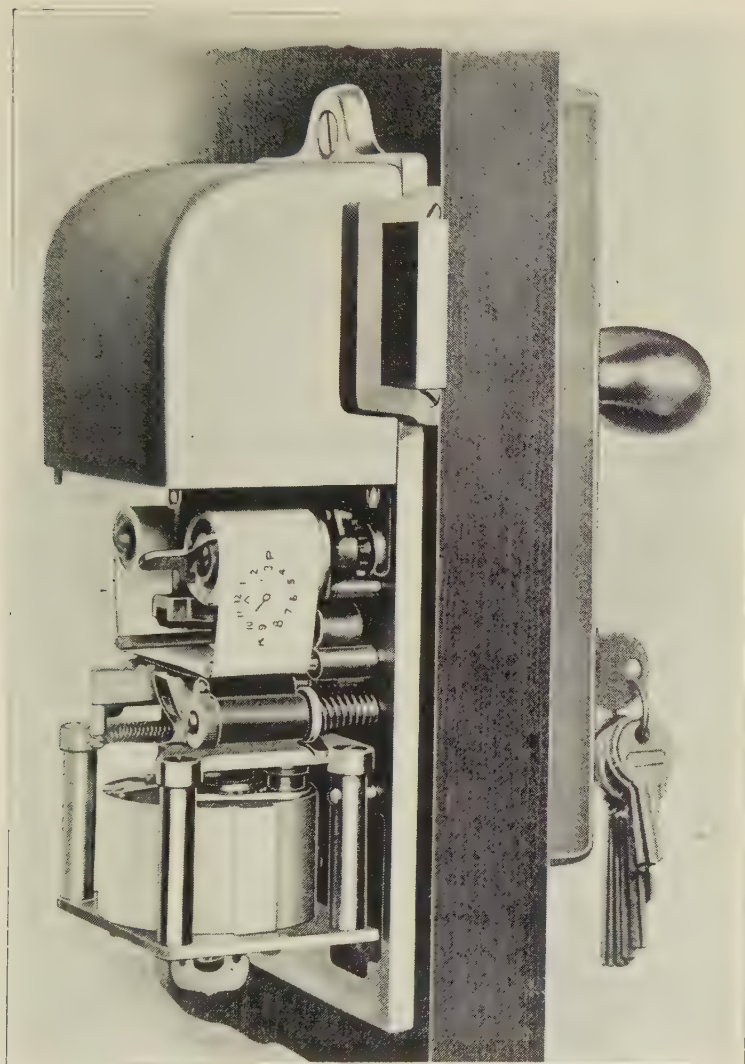


Figure 236: Another kind of record made by the door lock is a clock-dial design on a paper tape which receives the mark of the key which turns the lock. All recording door locks keep the record secret from every one but the owner or other authorized person who holds the special key. The particular type of lock shown above is described on pages 530-531.

a central part of the building. The record, printed in one line, shows his identifying symbol, the number of the station from which he registered, and the time he registered—date, hour, and minute, as pictured in Figure 238.

Another type of electric system is shown in Figure 239. The recorder is located at a central place and the stations, each connected with the recorder, are located at any desired places on the premises to be patrolled. The record of each station is shown in a separate space on the rectangular, ruled-paper dial fastened over a hard-rubber drum in the central recorder. This drum is automatically shifted so that each day's or night's record appears in its respective

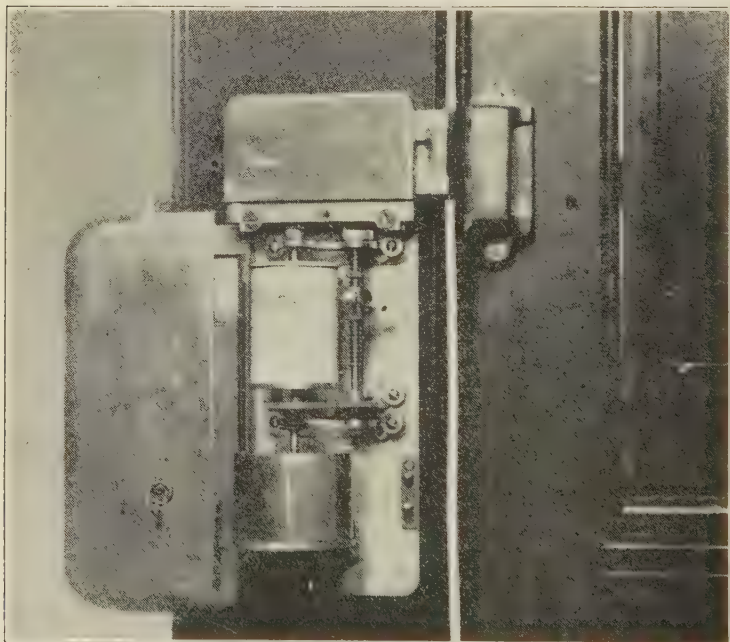


Figure 237: Secret records showing whether or not an establishment is open for business every morning at the proper time and remains open until the proper closing time and whether it is unlocked after business hours are furnished by time clocks. This one, described on page 531, makes a mark with a stylus upon a rotating chart when a key is turned.

column. While each watchman makes a separate record, all the records of all watchmen appear on the one central dial.

Each watchman carries a crank. When he wishes to register at any station, he inserts the crank and gives it a turn. A turn of the crank revolves the shaft of a small magneto, generating electricity which causes a record of the watchman's visit to register on the central dial.

One model provides a 48-hour record, giving separate registrations from Saturday to Monday morning without changing the dial. Another gives a 72-hour record, that is, for 6 consecutive 12-hour trips of the watchman. This provides for such occasions as holidays and Sundays coming together and affords a complete record during the time the plant is closed without changing the dial. Still other clocks make 12-hour or 24-hour records. Recorders are furnished in sizes to accommodate from 2 to 60 stations.¹

*Portable Watchclocks.*² Very different from the equipment just described is the device shown in Figure 240. One or more portable watchclocks and a series of patrol stations located at important inspection points comprise the system.

To each station a key is fastened and sealed so that it cannot be removed without detection. The watchman carries the clock slung over his shoulder and as he reaches each station inserts and turns the key in his clock, thereby registering the distinctive character or figure of that station at a certain point on a circular paper dial within the clock itself. The embossing is done by a pricking device in the clock, actuated by the turning of the key.

The paper dials are usually arranged for 24 hours to provide a record for Sunday and holiday registration without necessitating the changing of dials. If desired, 12-hour dials may be had. Registration on the same dial for two

¹This type of equipment is manufactured by such companies as Detex Watchclock Corporation.

²Equipment of this kind is manufactured by such companies as Detex Watchclock Corporation.

nights is made possible by the watchman's starting his rounds on the half-hour instead of on the even hour.

In many plants the combination of all the recording stations in a department spell on the paper dial the name or an abbreviation of the name of the department. Other companies use numerals; some prefer combinations. Whatever arrangement is ordered, each station in a plant is given a recording identity which cannot be confused with any other.

Before being put into the clock, each dial is dated and initialed by the supervisor, and after recording is completed, the record is removed and kept on a consecutive file for inspection by the management, underwriters, and others.

The clock itself is locked while in possession of the watchman so that he *cannot* examine his records or tamper with them without being detected.

One system is a bit different in that the recording mechanism is fastened in the station and the portable clock is merely a record carrier. To make his record, the watchman opens the station and presses the recording mechanism into a sort of slot in his clock, thus embossing the distinguishing mark of that station on the paper dial inside the clock.

PROGRAM INSTRUMENTS¹

Program instruments used in connection with electric time systems ring bells and gongs and sound whistles or signals according to scheduled requirements. They are installed in schools, factories, and offices where signals start and stop classes, meetings, or working periods.

All companies make program instruments to meet any requirements as to the number of circuits and schedules to be operated. For example, if certain departments in a business or school are operated on a certain schedule or

¹Manufactured by such companies as The Cincinnati Time Recorder Company; The E. Howard Clock Company; International Time Recording Company; Stromberg Electric Company.

working hours and other departments on different schedules, the signals in each department can be operated to conform to the working schedule no matter how many independent departments or schedules automatically change and operate the same signals on different days of the week and will automatically cause any schedule to remain silent on any day or days of the week desired. For instance, it is frequently desired to operate signals on certain schedules five days a week and the same signals on different schedules on Saturday, all signals remaining silent on Sundays.

SERVICE RENDERED BY TIME-RECORDING DEVICES

In an age when every minute counts, an assurance that in each hour of the working day a full hour's work is accom-

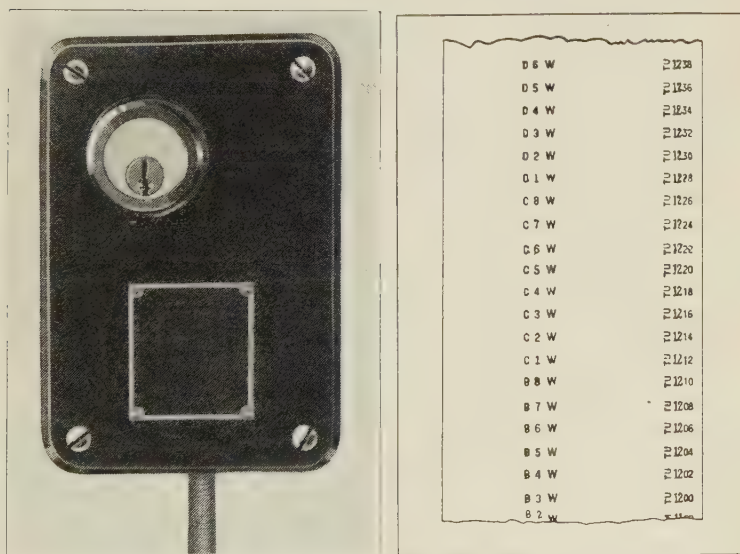


Figure 238: Watchman's station equipment gives certainty that premises are guarded every minute. Several types are described on page 532. Reproduced here is a station controlled by a master-clock. Each watchman has a key which causes his identification, the station, the day, hour, and minute to be printed on a strip of paper in the recorder.

plished is indispensable. This, in brief, is the service that the various mechanical time-recording devices render.

Attendance time recorders promote discipline and the full-time habit; they save supervision time because each employee records his own working hours. Moreover, by eliminating the necessity of keeping or transcribing pay-roll records, clerical labor in the pay-roll department is reduced.

Most efficient use of time recorders is possible if the

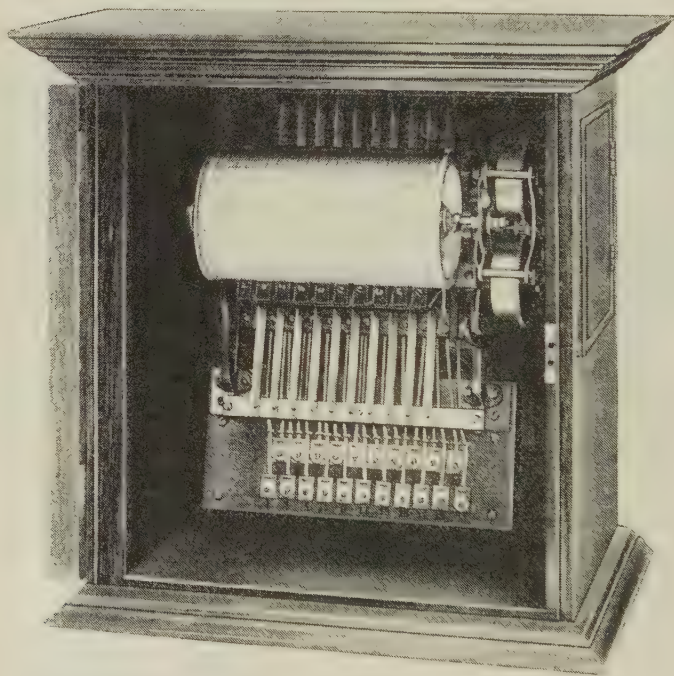


Figure 239: One watchman's system consists of a recorder like that shown above and a number of stations located throughout the premises to be patrolled. Each watchman carries a crank which he turns in the station, thereby perforating the paper dial in the space corresponding to the number of the station operated.

machines are placed in the several departments so that employees record the time immediately before reaching or directly after leaving their desks. The practice at one time was to place the recorder at the main entrance, which meant that the employees had to stop at the cloakroom between the time they registered "In" and the time they reached their desks, and vice versa when registering "Out."

While primarily time recorders are used to provide complete, accurate time records of arrivals and departures of employees, certain models of attendance time records can be put to other, additional uses. If the employer installs the type of recorder which furnishes the time record for each day perpendicularly on the card, the reasons for extra arrivals and departures during the day may be accounted for

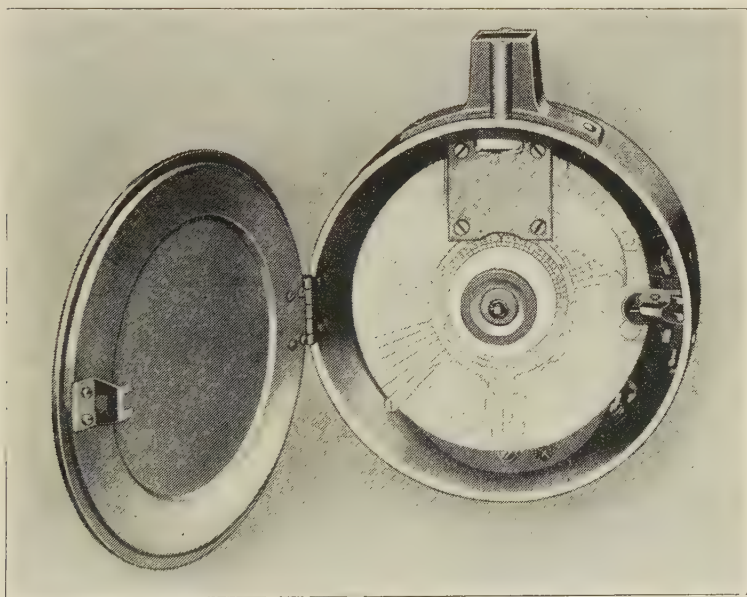


Figure 240: Any number of portable watchclocks and a series of stations—each with a key attached—comprise another system of insuring proper patrol. As the watchman reaches a station, he inserts the key in the clock which he carries, thereby registering the number of the station on the paper dial. The portable clock shown here is open, to reveal the paper dial.

directly on the card. For instance, a messenger may be sent to the bank. If he inserts "Bank" or some similar indication alongside or below his time registration on his card, it will always give some idea of where he is and approximately when he should be back. The autographic type of time recorder also has this extra use feature. This latter device is ideal for offices employing messenger services, as the system is very elastic and permits of an unlimited number of time registrations, signatures, and notations during the day.

Besides promoting punctuality and the full-time habit the recorders furnish important data for pay-rolls, promotions, salary increases, time and cash bonuses, and so forth.

The time recorder as an office appliance is in the unique position of being the first and the last machine employees use in their day's work. The service these mechanical devices render includes the elimination of time losses, the maintaining of maximum production, and the promotion of discipline and punctuality. In addition, the pay-roll clerical work is reduced fully 90% where these mechanical recorders are used, and infallible correctness to the minute is insured. Timekeeping and, therefore, pay-roll accounting, as well as cost accounting, are placed on a basis of absolute accuracy. Harmony is preserved and the loss of valued employees is avoided by the elimination of pay-roll errors and disputes. And most important of all, these devices insure the greatest item of expense of the business man—the labor bill—against losses.

XXX

INTERCOMMUNICATING SYSTEMS

Rapid communication a necessity. Answering the demand for easy communication. The purpose of intercommunicating devices is twofold. Intercommunicating telephone systems: manual system; automatic system. Telephone attachments: voice silencers; holder attachments. Electric paging system. Electric alarm systems. The telegraph typewriter. Credit authorization systems: electric authorizing telephone; the telautograph. Mechanical messengers: wire-line carriers; cable carriers; pneumatic tube systems; belt conveyers. The scope of intercommunicating systems.

THE tremendous growth and progress of modern business has brought with it a simultaneous development of a number of mechanical systems for quick and easy communication between various departments and individuals. These systems have been of the utmost importance in making the transaction of routine business a simple matter and in promoting a closer and more responsive cooperation among the working units of large business houses.

For many years the most favored method of intercommunication was by means of messengers. This meant that there entered into every transaction the possibility of inaccuracy, delay, fatigue, and even money loss, where messengers proved unreliable. With the expansion of modern business, departments began to be separated—sometimes on the same floor, often on different floors of the same building. All of these changes created a basic need for some permanent, rapid, and accurate form of communication.

The present-day mechanical systems are the direct result of this urgent need, and so well have they served the purpose for which they were created that there is scarcely a business organization of any size that does not employ one or more of these devices. The history of the development of intercommunicating systems is so interwoven with

the specific purposes for which they were designed that perhaps the best way to trace them is to give the need they serve and then to sketch briefly the development of the idea.

ANSWERING THE DEMAND FOR EASY COMMUNICATION

Modern business offices are forced by their very size to occupy large areas of space, often on different floors of a building and sometimes actually in separate buildings. In attempting to reduce to a minimum the time that was spent in employing messengers or by the various individuals themselves leaving their own departments to visit other departments for communication purposes, the private or so-called "house-phone" came into the foreground.

Since 1876, when Alexander Graham Bell's telephone patent was granted, the telephone has ranked as one of the most important and valuable instruments of communication. As an intercommunicating device the telephone also ranks among the first. The private branch exchange¹ has made possible communication between individuals in offices separated by great distances, and it acts as a uniting factor for offices and factories. It was not until the first years of the twentieth century, however, that the automatic switchboards made it possible to obtain telephonic communication without the aid of an operator. This was accomplished by the development of a practical means of applying automatic operation to the principle of transfer trunking between small groups of lines.

With the continued development of industrial plants, retail and wholesale stores, and factories, there arose another important problem the solution of which likewise depended on a mechanical system. At any moment during a busy day there may come a most important call for an executive who at that time has, perhaps, left his office. The operator rings the bell without success and in the meantime the person at

¹A Private Exchange has no outside connections; a Private Branch Exchange is a branch of main exchange and has outgoing lines.

the other end of the wire becomes impatient. In large business enterprises this delay and the resulting impatience often mean a definite loss of business in addition to inconvenience. To answer this need there was developed an electric paging system by means of which signals are sounded from a central objective and the person being paged can quickly recognize his own code call and answer it. There is no delay and no



Figure 241: This private switchboard handles house calls as well as outside public calls. Note how the operator is making a connection. An explanation of the manual system is given on page 551.

one is inconvenienced by having to answer a telephone and look for the person who is called.

The telegraph typewriter makes possible the transmission of typewritten messages by means of two devices, one a sending or control device, the other a receiving device. The need for this mechanical messenger was especially apparent in those large organizations where hundreds of messages are received daily, and where the old system necessitated that each of those messages be typewritten before it could be transmitted.

Another important intercommunicating device developed was the electric authorizing or credit system for use in retail stores. The development of the credit system in retail stores began when the merchant first endeavored to remember the condition of each of his customers' credit accounts. When this became impossible because of the increase of business, a credit manager was installed to put

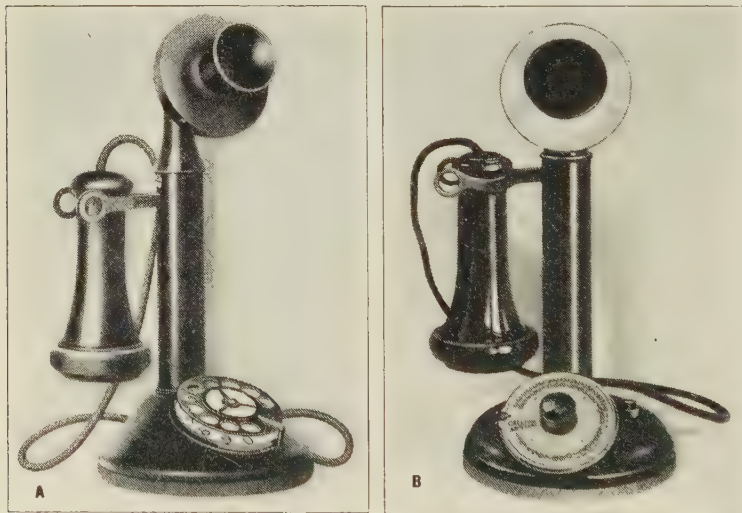


Figure 242: The automatic system makes it possible to carry on a large number of conversations at the same time without the aid of an operator. Compare the dial of illustration A with that of illustration B. Pages 552 to 555 explain how these two instruments are operated,

his o.k. on each credit sale. But as the store grew still larger the system of sending the sales slip by messenger boy for the credit manager's o.k. meant a considerable loss of time for the customer. Therefore, to obviate this, a new credit system was sought.

The electric "o.k." authorizing system was first developed in 1904. The equipment at this time consisted of a simple telephone circuit combined with an electric stamp. Up to the present time the system has been so well developed that it is possible for a salesperson to select any particular division of accounts on the telephone and call an authorizer who has charge of that particular group of accounts. Many improvements have also been made in the controlling system in order to consume the very least possible time



Figure 243: Without the operator's assistance as many as 11 separate conversations may be carried on when this type of apparatus is used. Read the section on automatic systems to understand how this system differs from the two automatic systems illustrated in Figure 242.

in getting the "o.k." back to the sales department. With the stamping mechanism in the sales department at the present time it is possible to show on which station the check was authorized and the date.

A system which makes possible the transmission of actual handwriting provides for communication between departments and distant points. The telautograph transmits any message, sketch, and so forth, in the actual handwriting of the sender, as rapidly as the sender may write it, to any station connected. It is possible to operate the telautograph between points as distant as 25 miles from each other.

The cable carrier, wire line, and pneumatic tube systems are popularly used as means for authorizing credit in retail department stores, and they serve an important additional function in transmitting important papers, merchandise, and even money. These systems are employed for this purpose in retail stores and large industrial plants. The idea of using mechanical messengers to convey merchandise, papers, or money originated in 1854 in Paris, France. Originally these tubes were operated by currents

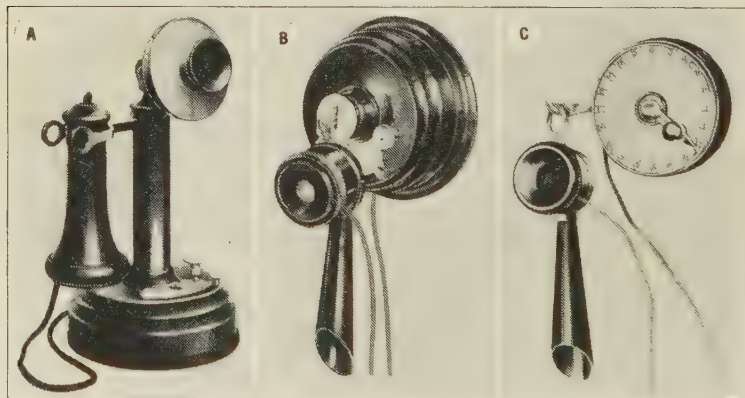


Figure 244: The multiple-wire type telephones shown here are described on page 556. To operate, the pointer is moved to the desired number and pushing the button buzzes the instrument at the other end. If there are 20 telephones in such a system, as many as 10 separate conversations can be carried on at the same time.

of compressed air which gave the carrier the needed impetus to reach the desired place. In 1890 the pneumatic tube system was introduced in the United States, but the process was reversed—suction, instead of pressure, was employed to carry the carrier through. Since then, numerous improvements have been made in this system.

PURPOSE OF INTERCOMMUNICATING DEVICES IS TWOFOLD

All intercommunicating devices are designed for one of two general purposes: first, to facilitate communication between individuals or departments; second, for the transmitting of messages, money, papers, or merchandise by mechanical conveyers. These two purposes are the bases of classification of all intercommunicating systems; but,



Figure 245: One type of interior telephone system consists of a master station for the executive, connected with other master stations and any number of substations like that shown in the lower left-hand corner above, for the staff members. Pages 557 to 560 explain how conversations are carried on with such a system.

since each intercommunicating device is a distinct and separate instrument of communication, it is difficult to give a related and logical classification. It is an interesting point to note here that while all of these devices answer one of the two general purposes, each of them has a particular purpose, so that many concerns find the need of not only one but of several intercommunicating devices to carry on



Figure 246: The loud-speaking telephone system shown here and described on pages 560 and 561 consists of a master station and one or more loud-speaker stations. The telephone and the control box with a key for each loud-speaker station make up the master-station equipment. See A and B, above. The loud-speaker station embodies a loud-speaker receiver and a sensitive transmitter enclosed in a metal shell (See C) with perforated front.

business in an efficient manner. This may further indicate the difficulties in making an "iron bound" classification. Any division must necessarily be arbitrary. With these points in mind, consider for a moment the plan of this chapter.

First, the intercommunicating telephone and its attachments will be treated. Under this point comes the discussion of the two kinds of intercommunicating telephone systems: the manual and the automatic. The attachments which act as an aid to intercommunicating telephone systems are voice silencers and holder attachments.

Second, the paging systems, by which individuals may be located any place in the building, will be described.

Third, the telegraph typewriter, that instrument which makes possible the transmitting of typed messages from one remote point to another, will be discussed.

Fourth, credit authorization systems will be taken up. Under this point several systems will be described, as there are many devices which are used as a means of determining credit; namely, the authorizing telephone system, the



Figure 247: With voice silencers such as are shown here several persons in the same room may carry on conversations at the same time without disturbing one another. For complete details of this service refer to page 562.

telaugraph system which transmits handwritten messages, and the system which employs mechanical conveyers or carriers. Another service of the mechanical carrier system—equally as important as the credit authorization—is the transmission of money, papers, messages, and merchandise. As the same general principle is used to carry out both services, and as the transmission of merchandise is the second purpose of intercommunicating devices, the various kinds of mechanical carriers will be discussed under the general heading, Mechanical Messengers, on page 571.



Figure 248: A voice-silencing device like this may be attached to any telephone; it enables one to converse with secrecy, eliminates the disturbances and loud voices, and at the same time assists in carrying clear and distinct tones to the listener. See page 563.

INTERCOMMUNICATING TELEPHONE SYSTEMS

Probably one of the best known and most widely used communicating systems is the telephone. The ordinary desk telephone is so widely known that to describe it here would be superfluous, and the fact that it is indispensable in the office is, of course, accepted by all. However, it is well worth studying the various developments of this well-known device as an intercommunicating instrument. The best way to make use of the telephone as a device for communication between individuals in remote offices is a problem which has been worked out in various ways. It may be stated, for the purpose of this book, that there are two types of intercommunicating telephone systems: one, the manual; the other, the automatic. The manual system makes it possible for a group of individuals on the same private branch exchange to communicate by means of a personally operated switchboard. The automatic system makes it possible for a group of individuals on the same exchange to communicate without the medium of an operator.

*Manual System.*¹ Because of its adaptability to business, large and small, the private switchboard has a very wide use. Furthermore, the ease with which the private or "house phone" system may be united with the public or outside telephone system has added to its popularity. The service rendered by the private exchange is twofold. It provides private communication facilities between a certain group of stations, and it is easily connected with the public telephone service. In this case the central operator controls both the local and the outside calls.

The private system varies in line capacity, ranging from a two-station to a hundred-line capacity. The system is equipped with a switchboard which is adapted for connec-

¹The manual system intercommunicating telephone is manufactured by Kellogg Switchboard and Supply Company and Stromberg-Carlson Telephone Manufacturing Company.

tion with any type of city exchange. The switchboard cabinet varies in size, according to the number of lines required.

A particular advantage of this switchboard is that, should the exchange requirements grow beyond the capacity of 50 lines, an additional section may be matched to the original section. Such a combination of sections would give an ultimate capacity of 100 stations. The station lines terminate at the switchboard on lamp signals and the connecting circuits each consist of three conductor plugs, three conductor cords, double lamp-supervisory signals, a listening key, a ringing key, condensers, and controlling relays (see Figure 241).

Automatic System. Under this heading come two general types of inside telephones. One, usually called the private automatic exchange, operates by means of an automatic switchboard.¹ With the other type, which we shall refer to as the multiple wire, connections are made not through an automatic switchboard, but through wires running from each telephone to all others in the system.² Several types of intercommunicating telephone systems which do not require an operator to make a connection and are, therefore, in this sense automatic telephones are seen in Figures 242, 243, 244, and 245. The private automatic exchange telephone differs little in appearance from the standard type. The only difference is in the dial, or calling device, which is mounted on the instrument. Model A shown in Figure 242 is constructed so that the numerals 1 to 9 and 0 appear through small circular openings on the dial. Illustration B

¹Such companies as Automatic Electric Company; The North Electric Manufacturing Company; and The Screw Machine Products Corporation manufacture the automatic switchboard; such companies as American Electric Company and Kellogg Switchboard and Supply Company manufacture instruments which are used with the automatic switchboards.

²Such companies as American Electric Company; Callophone Company of New York; Dictograph Products Corporation; Direct-Line Telephone Company; Federal Telephone Manufacturing Company; The Holtzer-Cabot Electric Company; and Stromberg-Carlson Telephone Manufacturing Company manufacture the multiple wire system.

of Figure 242 uses the dial upon which are the numerals 1 to 55. As the illustrations indicate, the chief difference in appearance between the various kinds of automatic telephones is in the dial mounted on the telephone. Notice that illustration B has a button at the side of the dial. Pressure of this button, *after the number has been dialed*, signals the station called.

The operation of the automatic telephone is very simple. The receiver is lifted from the hook and the desired number is called by simply operating a dial on the instrument. The automatic switchboard does the rest. Frequently a private automatic telephone system is installed with facilities for trunk connections to the public telephones on an employee's desk.

This method of operation can best be understood, perhaps, by considering a typical "house phone" call. Suppose, for example, Mr. X, who uses the telephone shown in A of Figure 242, wishes to call Mr. Y, whose number is 69. Mr. X lifts the receiver of his telephone and is instantly con-



Figure 249: The collapsible model telephone bracket illustrated above is easily and instantly adjustable to different lengths. With the telephone mounted on such an extension, the instrument may be used from either the standing or sitting position.

nected by some form of line switch or equivalent all-relay gear, to an idle connector (or talking trunk) which may also be operated by a switch or equivalent all-relay gear. He then turns the dial to the figure "6" and releases it. In turning back to its original position the dial transmits a series of six electrical impulses to the connector. In a simi-

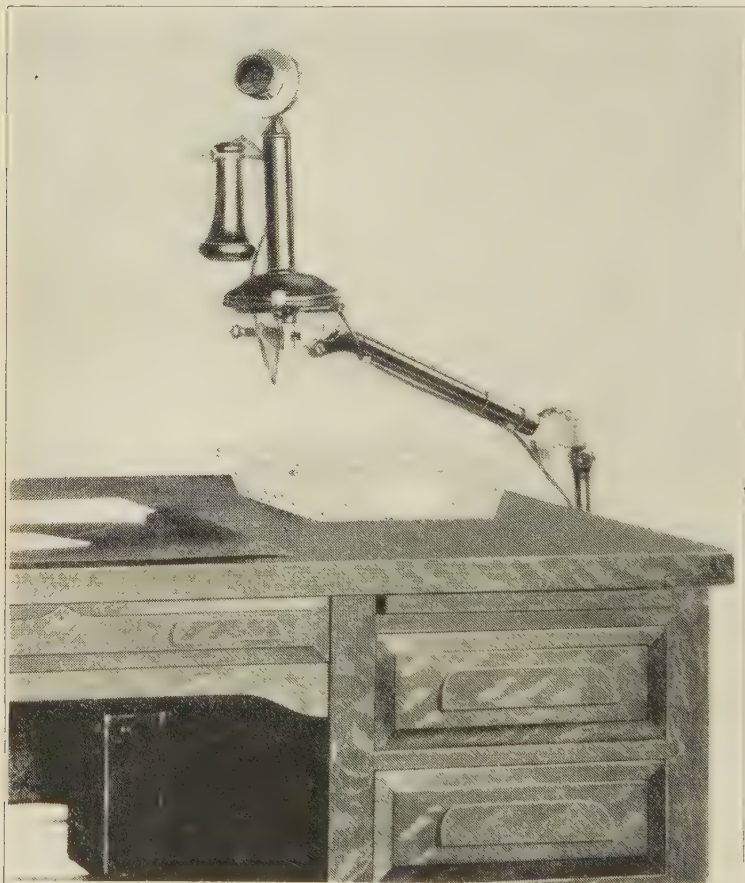


Figure 250: Telephone attachments which facilitate handling the telephone remove many irritating annoyances. This illustration shows how the telephone holder swings the desk phone above the desk, thus eliminating the possibility of upsetting inkstand or disturbing papers. See page 563.

lar way, dialing the second figure "9" causes nine impulses to be transmitted to the connector. Acting under the control of these impulses the connector immediately establishes connection with the terminals of line number "69" and intermittently rings the bell of Mr. Y's telephone until he answers.

The telephone which is shown in illustration B of Figure 242 is similar, in principle of operation, to the one just described. The chief differences are that the receiver need not be lifted while selecting the number, and that one movement of the dial connects with any station up to 55. It is unlimited as to the number of conversations that can be carried on at the same time; that is, with the 50-station systems 25 different private conversations may be in progress at one time and the general paging system also in operation without interference. The button at the side of the dial is used for signaling the called station. In addition to the use of automatic switchboard systems for communication and organization control, a number of services can be included, such as conference arrangement; code call system, for locating executives; watchman service, for protection of office and plant; fire-alarm system, warning of danger or emergency; annunciator service, for calling stenographers, messengers, and office personnel; and pick-up service, allowing one telephone to answer another in the absence of the called party.

Now we come to the consideration of those systems which we have elected to call multiple-wire systems. It should be explained at this point that some systems are operated on what is known as the common-ringing, common-talking principle—that is, all instruments are connected to common wires and it is necessary that each party have a code ring. When two people are talking, other parties can listen in. Other systems have a separate button for each party in the system, but any one may listen in and only one conversation can be carried on at the same time. Such systems are designated as selective-ringing common-talking. Still another

kind has both the selective-ringing feature and the selective-talking feature. There is a separate button for each party; moreover, a number of conversations can be carried on at the same time.

The system which consists of a cable containing a pair of wires which run to every other instrument, makes the connection by pressing the button connecting with the particular pair of wires which run to the station desired (see Figure 243).

Each telephone station may select, ring, and talk with any of the stations which may be using the system at the same time. For example, it is possible with a fully equipped 22-station system to carry on 11 separate conversations without cross-talking, cross-ringing, or other interference.

To establish a connection with another local station it is only necessary to press one button once, which is used for both selecting and ringing the desired telephone. The push-button switching keys used have three operating positions—normal, talking, and ringing. When the button is pushed all the way down, a circuit is closed which rings the bell of the distant telephone. When the button is released, it snaps back half-way to the talking position and completes the talking circuit with the telephone called.

The desk type and the wall type with what is known as an air-o-phone (Figure 244) are of the multi-wiring type, enabling as many simultaneous conversations over the circuits as there are pairs of telephones installed. Any two telephones in connection are, in effect, on a private line not subject to entering in or listening-in from any other station. For these reasons they are called “secret-service” telephones.

They are operated in this way: On each telephone is a small aperture or window in the center of the plate attached to the base. To obtain a connection, this number plate is turned in either direction by means of the thumb-screw at the upper right until the desired number appears

under the window. This constitutes the connection by the person calling and the called line is signaled by depressing the button shown underneath the thumb-screw. A "busy" or "free" called line is indicated through the receiver at the calling station.

When a conversation is finished the receiver is placed on the hook. The telephone is automatically restored to its own line for incoming calls.

Three or more persons can hold a confidential conference over this system without interference from any telephone not connected with the conference. The "pick-up" feature is also incorporated in this system whereby a call unanswered at a signal station can be answered from another telephone. When desired, "Monitor" stations can be supplied for executives or officials through which instant access can be had by any other telephone even though the called station be busy at the time.

Another type of telephone made by the same company is shown in illustration C of Figure 244. It is limited to 20 stations and is of the wall type, though it may be attached to a desk by means of a special, rigid bracket. Established connections can be entered and overheard through any other telephone.

To operate, the receiver is removed, the pointer on the face of the dial turned to the number wanted, and the button pressed. If the called line is "busy," the conversation will be heard through the receiver. Replacing the instrument on its hook breaks the connection and automatically restores the telephone to the user's own line.

Figure 245 illustrates a type of system made up of any desired combination of master stations and substations.

A master station is installed for each executive who has need for one. With it he may confer with one, two, three or more of his staff at the same time. Notice that this device is a wooden cabinet with a key for each of the connecting stations. A loud-speaker makes it possible for the person

using the telephone to talk at a distance from the instrument. If the conversation is confidential or if he is talking to another master station, he uses the ear-piece.

To make a call, the proper key—each is labeled with the name of the party—is thrown, causing the buzzer to ring and the master control lamp to flash at the other end. The lamp gives the executive right-of-way and keeps him from being held up by busy wires.

When some one calls the executive, a white card flies up in a little space above the key corresponding with the station calling. Knowing who it is, the executive may answer or not, as he wishes. The little card remains in sight until he does answer. Thus if he is out of his office or busy the card remains as the record of the call, and he may get in touch with the party at his convenience.



Figure 251: The receiver holder affords two-handed freedom. Note how the arm may be adjusted to just the right position for the greatest comfort to the user. Such a device allows the user to fully concentrate upon the recording of statements. See page 564.

To answer a call, the executive throws in the key corresponding to the station calling, thereby establishing connection. He talks toward the instrument without raising his voice or using the ear-piece. The answering voice comes back through the loud-speaker. If the receiver is lifted from the hook, the voice comes through it in an ordinary tone, the loud-speaker being automatically cut off. Returning the receiver to the hook brings the loud-speaker into action again.

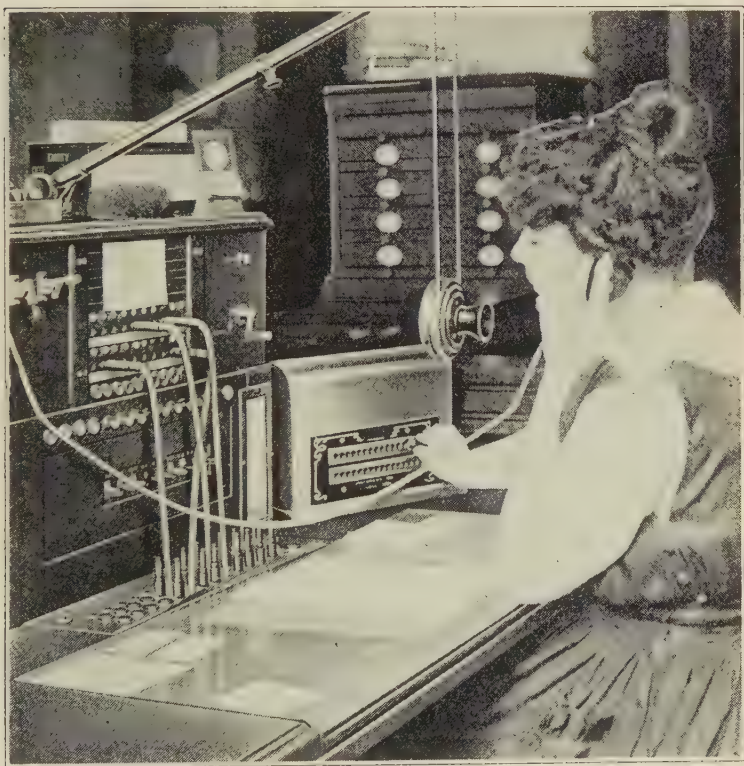


Figure 252: Here an electric paging system is in operation in connection with the switchboard. By means of this small device any person who has been assigned a signal can be located if he is in the building. Page 564 gives a detailed description of this paging system.

Master stations are made standard 4, 10, 15, 20, 25, 30, 35, 40 or more connections with other master stations or substations.

As seen from the small illustration in Figure 245, a substation is smaller than a master and has no loud-speaker. Each of the calling keys makes two connections—one on the up-stroke and the other on the down-stroke. Each operation is automatically locked, the key being restored to normal only when another key is thrown or the receiver returned to the hook. Above and below the keys are name strips showing the stations with which they connect.

If the intercommunication problem does not demand executive control or if the executives do not need the loud-speaker, a system consisting entirely of substations may be installed.

Still another type of device, one which gives instant, direct contact is a loud-speaking telephone system by means of which the person called can answer from a distance without approaching the instrument.

Such a system consists of one or more master stations and one or more loud-speaker stations, as conditions demand.

A desk telephone and control box with a key for each connecting station make up the master-station equipment, which may be located on a desk or wherever desired. (See Figure 246.)

A loud-speaker station consists of a loud-speaker receiver and a microphone transmitter and is equipped with a push-button for signaling the master station. (Illustration C of Figure 246.)

If a call is to be made from the master station, the man calling presses the proper key on the control box, takes the telephone receiver from the hook, speaks the name of the person with whom he wishes to talk, and then proceeds with the conversation. The attention of the called person is attracted by a sound issuing from the transmitter before the message is spoken. He answers from any place in the room, his voice being picked up by the sensitive transmitter in the

loud-speaker and reproduced in the receiver of the telephone on the caller's desk. The loud-speaker will pick up an answer from a distance approximately equal to that at which it (the loud-speaker) can be heard distinctly.

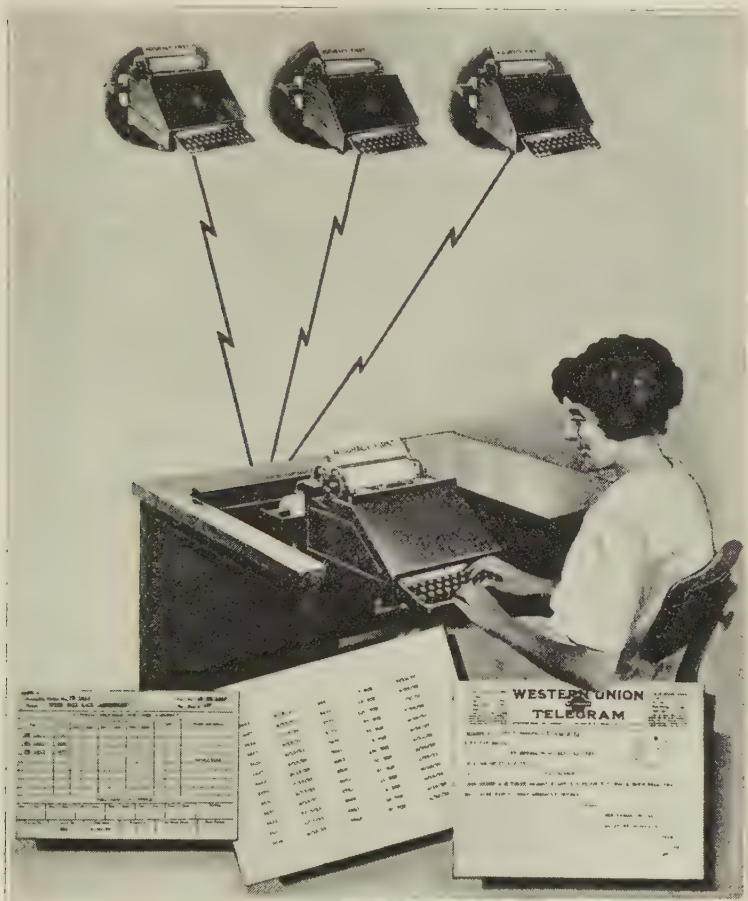


Figure 253: By means of this machine, which resembles the typewriter, typewritten messages may be sent to distant stations. Simultaneously as the operator writes the message the receiving machine mechanically types the message. Other interesting facts concerning this machine are given on page 568.

If a person wishes to call back to a master station from a loud-speaker station, he presses the push-button which buzzes the control box at the master station and turns the annunciator face above the key corresponding to the loud-speaker station calling to show white, telling the master who wishes to get in touch with him. The annunciator remains in this position until the master answers, giving thereby a record of the call so that he may talk to that person at his convenience.

Two master stations can talk to each other but two loud-speakers cannot communicate.

These systems are used in clubs for paging guests; in apartment houses as a means for callers to announce themselves; in restaurants, for transmitting orders from dining-room to kitchen; in depots, for announcing trains as well as in large offices and factories where instant communication is necessary.

TELEPHONE ATTACHMENTS

Certain attachments have been devised which act as an aid to all telephone systems. There are two types of such attachments, voice silencers and holder attachments.

*Voice Silencers.*¹ There are two mouthpieces which are built upon scientific lines to allow the speaker, when holding a telephone conversation, to speak in a low tone, even to the point of a whisper, and at the same time enable his listener to hear distinctly. The one shown in Figure 247 consists of a small parabolic sound reflector inserted in the transmitter mouthpiece. It is held in position on the mouthpiece by means of a clip which screws into the transmitter place just like the ordinary mouthpiece of the telephone. The theory of this device is that the parabolic reflector acts to concentrate the sound waves on the trans-

¹Manufactured by such companies as The Colytt Laboratories; Hush-1-Phone Corporation.

mitter diaphragm, thus enabling the lower tone to do the same work as was formerly done by loud speaking. Another advantage of the whispering mouthpiece is its sanitary feature. The entire mouthpiece may be readily washed and easily cleaned as it may be boiled to insure complete sanitation when it is in constant use.

The telephone mouthpiece attachment which is shown in Figure 248 is scientifically designed so that it absorbs sound waves not essential to transmission and provides a sufficient sound for perfect transmission. A sound-box slips over the ordinary mouthpiece of the telephone and is of sufficient size to permit the voice to expand. It is also of the proper design to fit about the lips in a manner which does not allow the voice to escape into the room (for actual position see Figure 248). In one sense, it is a substitute for a telephone booth, as it enables one to talk in an ordinary tone of voice, at the same time giving voice privacy, office quiet, and keeping surrounding noises out of the transmitter. The sound-absorption units placed in each end are easily and quickly removed, permitting cleansing the entire device in hot water. It is constructed of aluminum and thus is indestructible.

Holder Attachments. There are two kinds of holders for telephones which act as a great aid to all telephone systems: telephone holders and receiver holders.

The telephone holder¹ (Figures 249 and 250) swings over the desk, thus eliminating the possibility of upsetting ink-stands or disturbing papers. These illustrations also show how the arms which extend out over the desk terminate in a small circular platform upon which the base of the telephone fits. These attachments are made in various styles and will accommodate more than one telephone. The arms are adjustable, self-balancing in any position, and may be very easily operated, by merely swinging them over the desk.

¹Manufactured by such companies as American Electric Company and The Holtzer-Cabot Electric Company.

The receiver holder¹ is an attachment which affords two-handed freedom. Figure 251 shows how it is constructed. Its operation is very simple, as the illustration indicates. By a single lift of the holder, the telephone becomes automatically connected with the central operator. Ball joints enable adjustment of the receiver at the position most convenient for the user's hearing, thus leaving both hands free until conversation is finished. The holder consists of only two parts: the receiver, and the device which locks the receiver hook. Besides being of great convenience, the receiver holder also saves considerable time.

ELECTRIC PAGING SYSTEM²

There is now in the market an electrically operated signaling service which enables a concern to locate immediately, through the telephone operator, any person of the concern regardless of where he may be on the premises. The central sending station, usually located in the office near the telephone switchboard, automatically transmits audible code signals simultaneously throughout the building. The entire service is operated from the available lighting or power circuit and the use of batteries is entirely eliminated. The signals are made suitable to the office or store or to the noisiest factory department, and thus there is no question of signals being disturbing in quiet places or of not being heard in noisy places. Figure 252 illustrates one type of electric paging system.

To locate any party who has been assigned a signal, the operator inserts the plug in the connection corresponding to that particular person's number and by giving the plug a quarter-turn the call is sounded any desired number of

¹Manufactured by such companies as Hoban Receiver Holder Corporation.

²Manufactured by such companies as The Auto-Call Company; Automatic Electric Company; The Holtzer-Cabot Electric Company; The North Electric Manufacturing Company; Signal Electric Manufacturing Company; and Western Electric Company.

times, at brief intervals and at all signal stations simultaneously. The use of the plug for transmitting signals precludes all possibilities of two calls being sent in simultaneously, thus preventing "jumbling" of calls. As the signals are being transmitted, a colored prism pilot of light in the central cabinet indicates to the operator that the system is in operation. The signals are arranged in a code so that each individual signal is readily recognized.

A manually operated paging system is also on the market. The calling device is located on the switchboard and is made in three sizes, enabling the signaling of 10, 20, or 30 calls or individuals. The operator simply rotates the knob at the



Figure 254: When a salesperson uses an authorizing telephone system as described on page 569, she inserts the sales slip in the device and gives the credit department the necessary information. If credit is approved, the credit department operator merely presses the button which stamps the "o.k." on the sales slip. See Figure 255.

bottom, which causes the pointer to move up or down until it comes opposite the name wanted. The knob is then pushed up and allowed to return by gravity, which causes the desired code to be sounded three times and then stop. If the party called has not answered, the operator can repeat the call by pushing the plunger up again. The sending device has no motor. This particular paging system is controlled by the "sounding signals."

Another type of electric paging system is incorporated with the automatic telephone switchboard. This system is operated by the individual desiring the service, instead of a central operator. The code call is sent out by operating the dial exactly as though calling a telephone station. The called

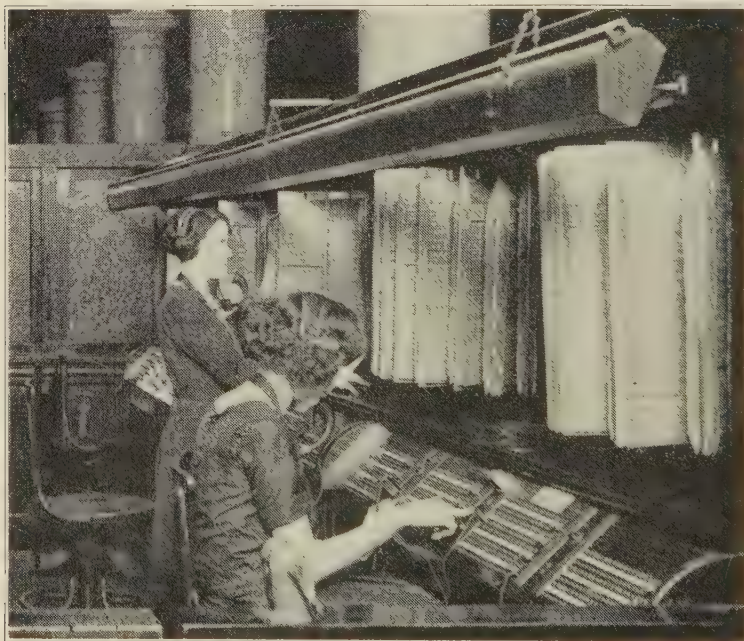


Figure 255: As soon as the credit department receives a call from a salesperson the credit clerk looks up the account in question and simply presses the button which stamps o.k. on the sales slip. Details are given on page 570.

party may answer by dialing a predetermined number. The automatic switchboard connects direct to the calling party.

ELECTRIC ALARM SYSTEMS¹

A system of communicating warnings of danger by means of signals offers a highly efficient means of protecting property from fire, theft, and other perils. Three of the important systems which this service offers are fire-alarm, burglar-alarm, and sprinkler supervisory services.

The automatic fire-alarm system makes possible instant detection of fire, by automatically sending out an alarm throughout the building and to a central station. The system consists of one or more signal transmitting stations with necessary preliminary stations and separate fire-alarm boxes installed throughout the protected premises or required by the fire underwriters. The signal transmitting stations are connected by electric circuit to a central station where signals are recorded on a registering instrument. At this central station the registering instruments are under constant supervision.

The operation of the fire-alarm system is based upon the expansion of air principle. Although the system "normalizes" for all ordinary changes of temperature, a small fire, even though remote, will be instantly detected. The fire itself automatically causes an alarm to be sounded in the central station and throughout the building where it is installed. Thus, the possibility of serious loss by fire is greatly minimized.

The sprinkler supervisory gives a detailed record of condition of sprinkler equipment. Like the fire-alarm system it is electrically connected with a central station where it transmits immediate warning of sprinkler trouble. Automatically the supervisory sends alarm of fire, warning when valves are closed, warning when water in a gravity tank is low, or

¹Services of this kind are rendered by such concerns as American District Telegraph Company.

approaches a probable freezing point or when air pressure on a dry system is too high or too low.

It sends immediate warning when water in a pressure tank varies beyond a safe margin from normal condition, when power supply for fire pump fails and when accidental leakage occurs. It also renders further services—as keeping underwriters informed daily of conditions of sprinkler protection and providing periodic inspection and testing of sprinkler equipment and supervisory attachments. Supervisory service men are stationed in the local central office and are constantly ready to hasten to any plant the moment the automatic signal is received.

The burglar-alarm system is usually installed in doors, windows, show-cases, storage cabinets, safes, vaults, and other places where valuables are kept. Tampering at any of these places where the system is installed automatically sends out an alarm throughout the building and to the central station. Electrically connected metal leaf automatically transmits the alarm.

THE TELEGRAPH TYPEWRITER¹

Although in outward appearance and in operation the telegraph typewriter resembles a typewriter, in principle of conveying the message it resembles a telegraph (see Figure 253). This electric message conveyer gives practically an unlimited service. The machines under control may be distant or they may be within the same building. Another flexibility of the machine is that any form of message may be sent.

The system is complete within itself and requires only one wire between the sending and receiving machines. There are no contacts at all in the receiving unit, and there are but one contact, one magnet, and one motor in the entire sys-

¹The telegraph typewriter is manufactured by such companies as Morkum-Kleinschmidt Corporation.

tem. When the "home typewriter" is operated, the words written are printed on the distant typewriter simultaneously. This is accomplished by a selecting method. When the electric impulses are received, a small mechanism receives the selection and transfers it to five selecting bars. The setting of these bars selects the proper pull bar and the selected words are printed. With the exception of the single selecting magnet and the transmitting contact, everything is entirely mechanical.

AUTHORIZING CREDIT SYSTEMS

There are three distinct types of authorizing credit systems commonly used in retail stores: the authorizing telephone; the telautograph, which transmits handwriting; and the merchandise and message carrier.

*Electric Authorizing Telephone.*¹ The authorizing telephone system consists essentially of specially constructed telephones placed in the selling departments and a central switchboard in the credit authorizing department. By means of an electric button on the switchboard the credit office stamps its o.k. on the sales slip which the salesperson has inserted in the stamping device on the telephone in the selling department. This system is designed to meet the needs of different stores. It ranges in size from a little cabinet built for the use of one credit authority in a very small store, to a large telephone switchboard operated by a force of 20 or more authorizers, such as is used by the largest department stores.

To operate the credit telephone system the salesperson places both the original and duplicate copies of sales slips in the credit telephone, presses the proper button, and is connected instantly with the authorizer in charge of that customer's account (see Figure 254). Details of the credit

¹Manufactured by such companies as The National Cash Register Company.

transaction are telephoned to the credit department by the salesperson. An amplifier device makes it possible for the salesperson to speak to the credit department in a low tone so that she will not be overheard by the customer and at the same time will be heard very distinctly by the authorizer. If the transaction is approved by the authorizer, she instantly flashes back her o.k. which is automatically printed on the sales check (see Figure 255).

If the sale is not approved, she presses a "ringing" button on the switchboard to call the salesperson to the telephone in that department. Telephonic communication is established when the salesperson removes the receiver from its hook. The authorizer advises the salesperson why the charge cannot be approved and tells her how to handle the case.

*Telautograph System.*¹ The instrument which is devised for the sending of handwritten messages to distant points by means of electric control, consists of transmitters and receivers and is operated by merely writing a message, sketch, and so forth, on a transmitter. The characters are thereby instantly reproduced on each receiver the sender may select—in the actual handwriting of the sender, and in indelible ink. One to one hundred receivers, at the will of the sender, instantaneously reproduce each character as rapidly as the sender may write it. Any person able to write may transmit messages. A permanent, indelible, and identifying record appears, and remains at each station connected (see Figure 256).

This system is operated by the salesperson, who merely writes the name and address of the customer with the amount of credit involved. The record, in the exact handwriting of the salesperson transmitting the inquiry, appears on a receiving instrument in the credit department as rapidly as the operator forms the characters on the paper in the sending

¹Manufactured by such companies as Telautograph Corporation.

instrument. The credit department replies to the inquiry in the handwriting of the credit clerk directly beneath the inquiry.

In some stores each record is torn off the machine and attached to the original charge slip. With this system, responsibility can never be shifted when errors on the part of the operators occur, and, of course, there is never any possibility of misunderstanding names, street addresses, and amounts.

In departments where customers charge and take purchases with them this system is especially valuable. The speed of the transmission and the identifying record at each end of the line make the recording device of particular value.

MECHANICAL MESSENGERS¹

One of the earliest intercommunicating systems is taken up here last, because it serves not only as a credit authorization device, but also as a conveyer of messages and merchandise. It is because of its twofold service—its value as a credit-authorizing system and at the same time its value as a mechanical messenger—that this order is followed.

There are three kinds of carriers, the wire line carrier, the cable carrier, and the pneumatic tubes. Each of these devices offers its own particular service to a certain type of work, and each may be used for the dual purpose: credit authorizing and merchandise conveying.

Wire-Line Carriers. The wire-line system consists of a conveyer or car which is mounted on light running wheels and taut wires which are stretched between stations. The cars are sent along the wires by means of a sending device which is operated by pulling a cord or handle-like propeller. The conveyers are constructed in many different styles

¹Mechanical messengers are manufactured by such companies as The Lamson Company.

adapted to particular needs. They are made for carrying money, papers or letters, small parts or tools, and merchandise.

In a retail store the wire-line system often has a central authorizing station where the same department handles credit and cash transactions. In many cases the article purchased is sent to this central department where the credit transaction is o.k.'d or the correct change made. At the same time the package is wrapped and returned to the salesperson who completes the transaction. The illustration in Figure 257 demonstrates how a wire-line system may be installed in an office, while Figure 258 illustrates how the same system may be installed in a retail store.

In offices where quantities of mail are handled the wire-line system may be installed with the central sending and receiving station at the mail desk. Stations may also be in-



Figure 256: Any message may be sent to one or fifty points by means of the telautograph shown here. Notice the pencil-like instrument which is used to form the characters on the continuous roll of paper. Also read pages 570 and 571 for the detailed account of this system.

stalled to connect offices which find it necessary to send communications of various sorts frequently.

Cable Carriers. The cable system may be summed up as a series of tracks over which small steel boxes are propelled along swiftly by rapidly running cables. The cable carrier is operated by a small motor which drives the cables running between light metal tracks, upon which sending and delivery stations are fixed at desired intervals. The rapidly running and noiseless cable engages the carriers and slides them swiftly along their tracks, up, down, around corners, and through partitions, floors or walls to their destinations where



Figure 257: A wire-line carrier system may be used in an office as well as in a retail store. Papers of all kinds, books, and so forth, may be carried with speed from desk to desk in the manner illustrated. The illustration on the next page shows how this system is installed in a retail store.

they are automatically and consecutively switched off and arrested at the hand of the clerk (see Figures 259 and 260). When the cable system is used in a department store, it answers the purposes of authorizing charge and carrying cash. The sales slips are conveyed directly from the clerk to the authorizer, who may be located at the central desk where cash is handled or in the credit department.

Pneumatic Tube Systems. There are three general kinds



Figure 258: This illustration shows how the wire-line system may be used in a retail store when a centralized department handles the cash and credit sales as well as the wrapping of parcels. An interesting account of this system and how it is applied to various uses is given on page 571.

of pneumatic tube systems: the vacuum, vacuo-pressure, and pressure. The difference is technical, the physical conditions to be overcome being the deciding factor. Each of these systems consists of a tube through which a carrier travels, either being drawn through by vacuum, forced through by pressure of air, or propelled by a combination of these.

Compressed air or vacuum is supplied usually by an electrically driven blower that runs continuously. Smaller systems, known as "Junior," are operated by small motor-driven blowers that are started by pressure on a button and stop automatically when the carrier leaves the tube. A still smaller tube system is operated by a foot-power bellows in a cabinet similar in size to a simple stack of filing drawers.

Tube systems are made in a wide range of standard sizes: $1\frac{1}{4}$, $2\frac{1}{4}$, 3, and 4 inches in diameter, and in ovals, 3 by 6 and 4 by 7 inches. The $1\frac{1}{4}$ -inch tube system is used by banks, insurance companies, hospitals, brokers' offices, stock exchanges, and other large offices where swift transfer of written messages is desirable. The $2\frac{1}{4}$ -inch size is popular with department stores, where it is used for carrying cash from salespeople to the central desk, or charge slips to the office for authorization. They are also used in business houses and industrial concerns for the transmission of messages, orders, correspondence, and blue-prints. The 4-inch tube, owing to the greater capacity of the carrier, carries, in addition, light loads of merchandise, such as fountain pens, watches, gloves, jewelry, tools, liquids in bottles, and so forth. The oval tubes are more generally used by banks and insurance companies for the handing of correspondence, policies, and pass-books. The carriers can be had with locks to insure safety.

Pneumatic tubes may be extended for great distances. They may be carried to every department of large plants. They may be installed indoors or out, upstairs or down, through walls or floors, across yards or underground. The foot-power tubes which are usually the $2\frac{1}{4}$ -inch size have

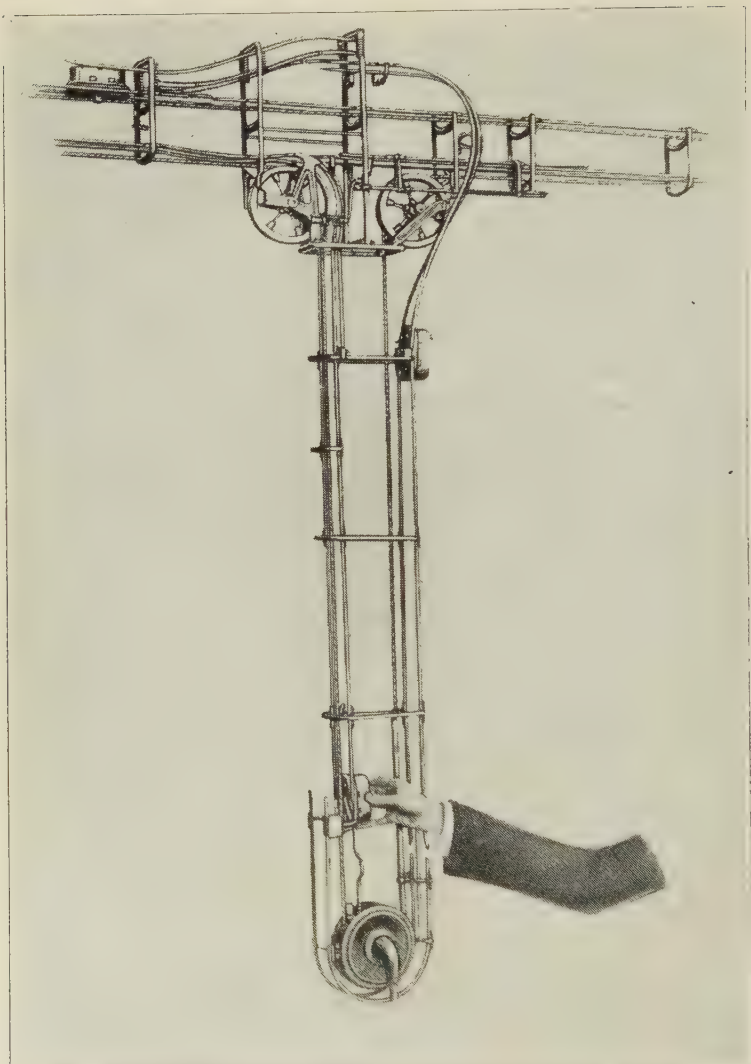


Figure 259: The illustration reproduced here demonstrates clearly how the cable carrier is operated. Note the small container which is being placed on the cable. The system is operated by a small motor which drives the cables running between light metal tracks. Figure 260 shows a central desk where an automatic cable system is installed.

naturally a more limited field, but are efficient up to 150 or 200 feet.

To operate a pneumatic tube system the load is placed in a carrier, which is then closed and slipped into the receiving terminal (see Figures 261 and 262). Instantly the air pressure or vacuum is automatically turned on, and continues until the carrier reaches its destination. Pneumatic carriers may be operated in both directions through a single tube, but better service is supplied by the two-way tube system, as the way is always open, so that messages may be sent instantly in either direction.

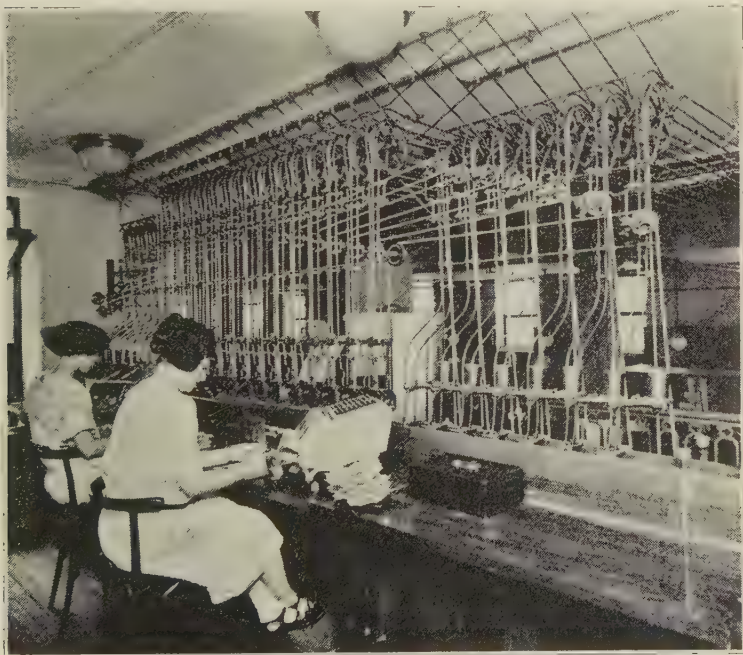


Figure 260: Here is a central desk of an automatic cable system. This department authorizes credit and handles cash. It is simply operated, as the cables run rapidly and noiselessly above their tracks, up, down, around corners, and through partitions to the central desk where they are automatically switched off. See page 573.

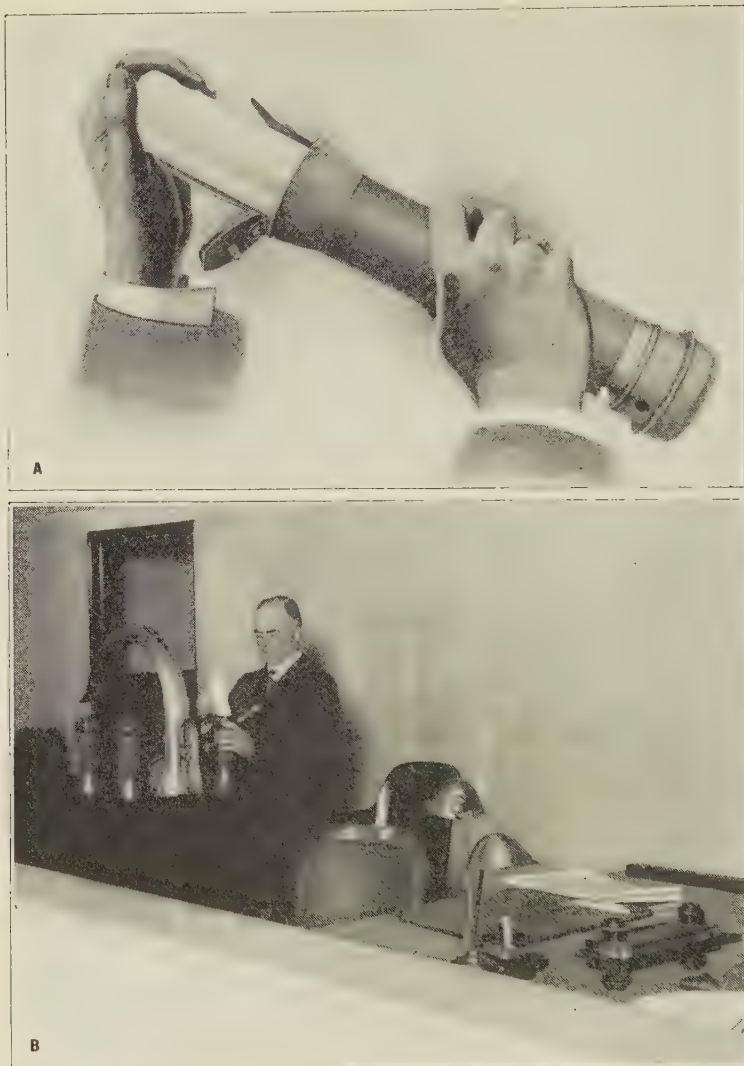


Figure 261: When the pneumatic tube system is used, papers may be inserted in the carriers as shown in illustration A and sent by means of the sending device (illustration B). A centralized sending and receiving station may be installed as indicated by Figure 262. For further details see page 577.

Belt Conveyers. Another device that is coming into use for the transmitting of papers and correspondence is the belt conveyer. It consists of an endless belt, driven by motor (see Figure 263). It may operate continuously or be started and stopped as needed. For carrying long distances the papers are put in a tote-box and placed on the conveyer. By the proper insertion of pins in the top of the box it automatically deflects a switch so it can be sent to any station desired.

In some wholesale houses a continuously moving belt conveyer runs between the order clerks. As fast as orders are written they are simply laid on the belt and automatically carried to a central point where they may be sent to the proper department. This prevents the orders from piling upon the desks of the clerks until the arrival of a messenger.

THE SCOPE OF INTERCOMMUNICATING SYSTEMS

So extensive is the scope of the various intercommunicating systems that it is difficult to estimate the particular business enterprises to which they render service. Practically every type of business—from the small retail store to the largest industrial plant—employs one or more of these intercommunicating systems. The advantages derived are obvious: time saving, increased efficiency, assured accuracy, decreased fatigue. The specific advantages to individual business enterprises from the use of particular intercommunicating systems can best be illustrated by naming the system and outlining in brief the field where it is popularly used. This method is followed in the succeeding paragraphs.

Intercommunicating Telephone Systems. Private exchange telephones, manual and automatic, are used primarily in offices to connect various department heads. They mean closer cooperation between departments, increased efficiency, and time saved. Furthermore, they are of such importance that there is scarcely a business which does not employ one of these systems.

The Electric Paging System. The electric signaling system is for the purpose of locating quickly individuals who are away from their desks and do not hear the telephone. It gives instantaneous service and is used extensively in large industrial plants as well as in large and small stores, banks, offices, garages, and so forth.

The Electric Alarm System. By means of an automatic fire-alarm signal, fire can be instantly detected. When the electric alarm system is connected with a central station it means that the property is under direct supervision at all time, day and night. Property may be protected from theft also by installing a burglar-alarm system.

The Telegraph Typewriter. The telegraph, railroad, and commercial fields have all benefited by the introduction of the telegraph typewriter. This system of intercommunication, by means of which a message typewritten at one point is received automatically and instantaneously in typewritten

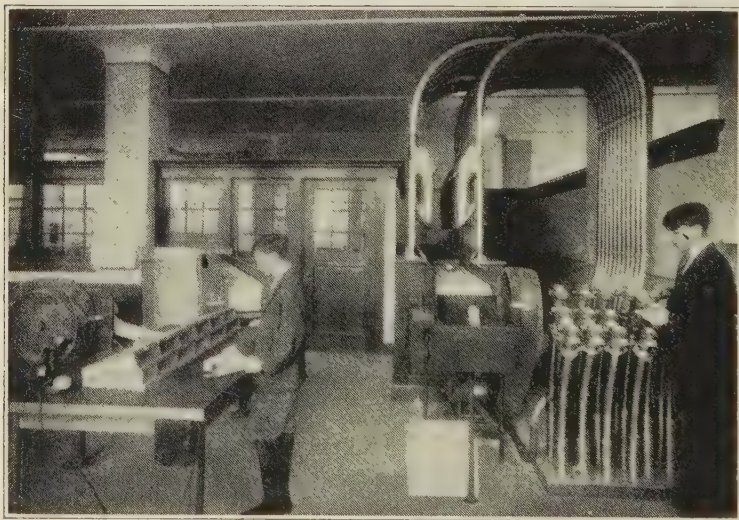


Figure 262: A centralized receiving and sending station is especially valuable for handling incoming and outgoing mail. Such a system can be installed to cover every department in the concern.

form at a distant point, is a service which is truly unique. Such a system makes for closer cooperation between departments or plants.

The Authorizing Credit System. The credit system is of considerable importance in retail department stores, and to assure accuracy in this work many of the stores use the authorizing credit telephone or the handwriting transmitter or mechanical carriers. Each of these mechanical devices works quickly, saves time and energy, and safeguards the store against unscrupulous shoppers who might try to obtain merchandise to a considerable amount whereas they are entitled to only a minimum of credit.

The Telautograph. The quick transmission of handwriting over wires from one point to any other in adjoining departments, buildings, or cities is being adopted by banks, hotels, railroad terminals, and many other classes of busi-

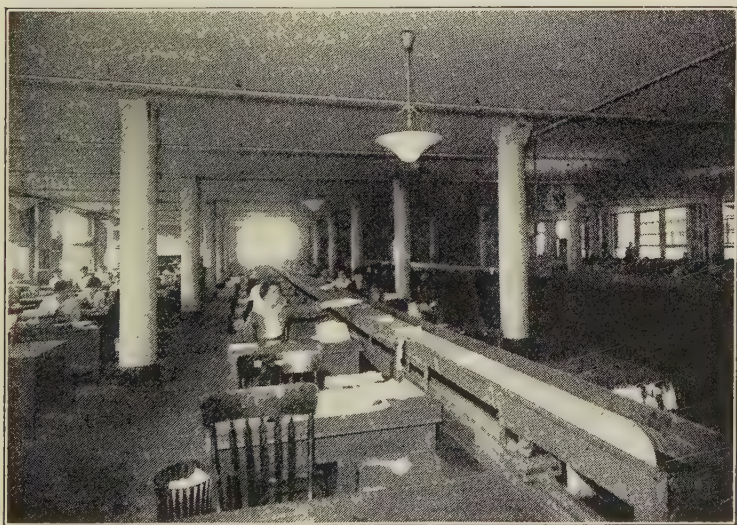


Figure 263: The belt conveyer shown here is another device used for carrying papers, correspondence, and so on. There are several forms of such conveyers, but all operate on the same principle. See the section on belt conveyers for full particulars.

ness, each system varying according to conditions existing in each establishment. The absolute accuracy, speed, and secrecy of the device make practically impossible the misunderstanding of names, street addresses, numbers, and figures, and furnishes an undeniable means of fixing responsibility of error.

The Mechanical Carrier. In offices, factories, retail stores—in fact, wherever messages, money, papers, or merchandise must be transmitted quickly and efficiently—mechanical carriers may be employed. They are used in many offices for the distributing of mail; in department stores to convey merchandise, cash, or credit slips to wrapper, cashier, and authorizer; in factories to transfer messages or papers, tools, or merchandise from one department to another. They save time, assure accuracy, and increase efficiency.

XXXI

MISCELLANEOUS OFFICE APPLIANCES

Automatic "ad"-stamper. Baling presses. Calculation stamps. Calculating rules. Counting machines. Coupon-printing machines. Envelope moisteners. Eyelet fasteners. Floor-scrubbing and polishing machines. Folding machines. Imprinting presses. Multiple stamps. Numbering machines. Paper-cutting machines: desk cutter; hand-lever cutter; motor-driven cutter. Paper punches. Perforating machines. Receipting-coupon cutters. Telephone indexes. Ticket-marking machines.

AUTOMATIC "AD"-STAMPER¹

THE device which makes possible the printing of "ads" on wrapping paper, letter-heads, envelopes, packages, and many other similar articles, is the automatic "ad"-stamper. The three models of this machine allow "ad" space in three sizes ranging from $1\frac{3}{4}$ by $5\frac{3}{4}$ to $3\frac{1}{2}$ by 6 inches. Each model is equipped with an automatic ink-fountain roller which gives a constant supply of ink to the printing die, thus insuring a perfect print.

The automatic "ad"-stamper is small and may be attached to a paper roll without adjustment, as is shown in the illustration in Figure 264. When used in this way it makes a continuous "ad." It may be used in various other ways, for instance, to stamp each shipment which leaves the office, letters as well as packages; to print blotters for distribution; to stamp bags, cards, letter-heads, and envelopes.

BALING PRESSES²

By baling and selling its waste paper, almost any business can salvage a surprising number of "pure velvet" dollars.

¹Manufactured by such companies as O. B. Whitaker Manufacturing Company.

²Manufactured by such companies as Davenport Manufacturing Company, Inc.; Economy Baler Company; Famous Manufacturing Company; Galland-Henning Manufacturing Company.

Furthermore, the practice of baling waste paper has what may prove to be an even more important advantage. Loose waste paper is not infrequently the starting place for a fire that may cost thousands of dollars. The reduction in fire hazard, resulting from the use of baling presses, and the money obtained from the sale of the baled waste, often pay big dividends on the cost of such machines.



Figure 264: The device attached to the roll of wrapping paper stamps a continuous "ad," as is shown here. It may be used in many other ways: for the printing of "ads" on letter-heads, envelopes, packages, and, in fact, on all kinds of shipments. For a description of this device, see page 583.

Baling presses are constructed of steel, built in many sizes, and may be operated by hand or by motor power. Illustration A shown in Figure 265 pictures how the paper may be dumped into the box-like body of the baler. It is very simple to operate the baling press, as the handle turns easily, pressing the plunger down upon the waste material and crushing it to the smallest possible volume. When the baler is filled, the wires which are run on each side are then clamped down, and the bale removed from the machine (see illustration B of Figure 265). Each day or each week the waste paper may be handled in this manner, thus eliminating a great fire hazard. Hence, the steel baler becomes, in a sense, a large fire-proof waste-basket.

There is scarcely a commercial or industrial institution of any kind that cannot find profitable use for one or more baling presses. This fact is due perhaps to the diversity of uses to which the press may be put. Hand baling presses

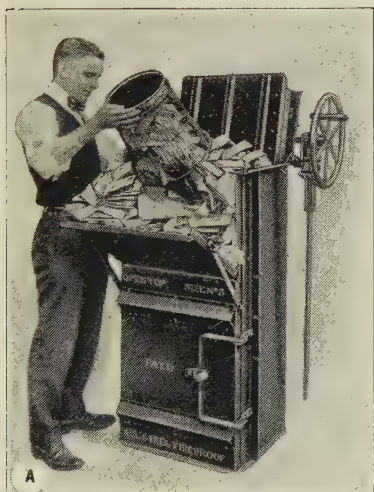


Figure 265: Machines which mechanically bale accumulations of paper, pasteboard, and other waste material prevent a tremendous waste of money, and, furthermore, diminish fire hazards. Illustration A shows how the baler is filled; illustration B, how the bale is removed. On pages 583 to 586 a detailed description is given.

are used extensively by small establishments where paper accumulates daily, and motor-driven presses have become almost indispensable in large institutions. Baling presses may be used not only for paper, but for various materials in numerous establishments of different kinds. For instance, baling presses are used in department stores and furniture stores for baling excelsior and burlap; by garment manufacturers for baling cloth scraps and clothing clippings; by glove and shoe manufacturers for baling leather clippings and leather scrap; in carpenter shops for baling shavings; by tinsmiths and tinware manufacturers for baling tin scrap; and even in machine-shops for baling steel and iron shavings.

CALCULATION STAMPS¹

Calculation stamps are made up in certain predetermined combinations which make it possible to stamp the calculated amounts due—gross, discount, and net—on bill and stub. These stamps are arranged in a tray or container which is made in unit dimensions of multiples of 50 to suit the number of stamps needed. Each stamp fits into its compartment and is labeled on the top so that the calculation each stamp covers can be told at a glance. The tray and stamps are pictured in Figure 266.

The tray is equipped with an ink pad which can be easily re-inked by removing the bottom of the case. When the stamp is removed from the tray it is always inked ready for use. The stamps are made up in many styles, as shown in Figure 266. The single style prints the gross, discount, and net amount and is often used for stamping the bill and the stub in two stamping operations. The double style stamps gross, discount, and net amounts on both the bill and the stub in one operation. Other styles may be had, such as, for instance, those which use larger figures on the stub than

¹Manufactured by such companies as Jas. H. Matthews and Company.

on the bill; those which print the gross, discount, and net amount on the bill and the net amount only on the stub; those which print the stamp number in a circle just above the net amount on the stub; and those which print the net amount only.

The versatility of this stamping device and the speed which it makes possible give it a very high value to such concerns as gas and electric light companies, public service corporations, and ice companies. Any concern, in fact, which



28.25	11.25	11.25	15.10	(45)
<u>1.00</u>	<u>.75</u>	<u>.75</u>	<u>.90</u>	
27.25	10.50	10.50	14.20	14.20

Figure 266: Amounts due—gross, discount, and net—can be calculated and stamped by these small devices. Contained in a self-inking tray are small stamps which imprint amounts in various styles. Single, double, and net styles can be printed as shown in the illustration. Read page 586 for a description of how these calculation stamps are used.

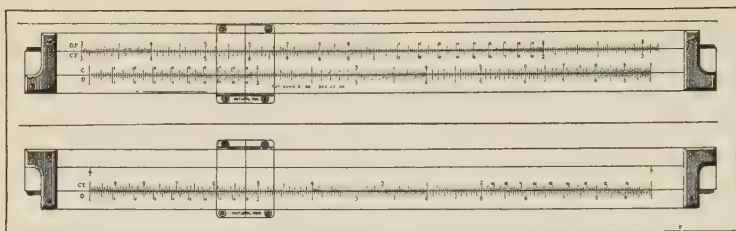


Figure 267: This calculating rule was devised especially for merchants and others who have the problems of discounts, simple and compound interest, prorating, and so forth. By learning to read the graduations on the scales in terms of numbers instead of measures of length, any one can use this instrument with a very great saving of time and mental effort.

makes up certain scheduled service bills, monthly or quarterly, will find this device of very great value.

CALCULATING RULES¹

The calculating slide-rule solves all manner of calculations, such as discounts, simple and compound interest, prorating, converting feet into meters, pounds into kilograms, foreign money into United States money, taking off from a price-list series of discounts, adding profits to costs, in other words, almost all problems which are of every-day occurrence in the office and shop.

A calculating slide-rule has been devised especially for the merchant and others who frequently have the same problems to solve. This special ruler uses several scales which simplify the use of the slide-rule for those whose problems are confined to multiplication and division. The rule is double-faced, and the front face carries four scales. The two adjacent scales on the upper edges of the rule and slide are alike, as are also those on the lower edges. The reverse side has only two scales, which are on the lower edge of slide and rule, the graduations of which run in opposite directions. A runner or indicator encircles the rule (see Figure 267). This indicator has a glass on each side with a

¹Manufactured by such companies as Keuffel & Esser Company.

fine hairline engraved thereon, and it is used to facilitate the working out of extended calculations without the necessity of reading off the intermediate results.

The operation of the slide-rule is simple; it is only necessary to learn to read the graduations on scales accurately in terms of numbers instead of measures of length.

Thousands of engineers, surveyors, and scientists in every profession and industry, as well as contractors, builders, and architects, have found the calculating rule in its various forms invaluable as a time and brain saver in quickly and accurately making a great variety of intricate and extended calculations. To the merchant, the accountant, office manager, mechanic, and foreman the calculating slide-rule is equally valuable. In fact, in any office where interest, simple and compound, is calculated, the slide-rule offers a quick and accurate means. Many other problems which confront

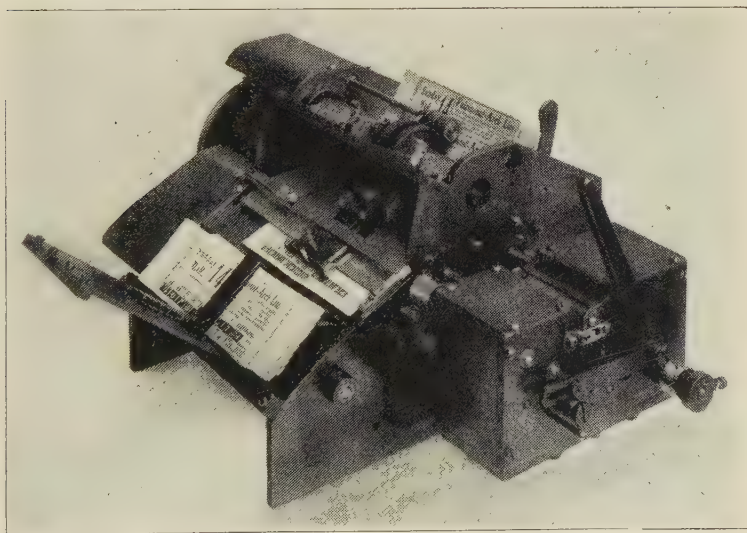


Figure 268: Concerns handling a great number of tickets find the counting machine such as pictured here of inestimable value. As the tickets are automatically fed through the machine, they are registered on two counters: one subtotal counter and one summary total counter. See page 590.

the office man can be solved by means of this handy instrument.

COUNTING MACHINES¹

A machine which will count accurately and speedily tickets, checks, transfers, and coupons is illustrated in Figure 268. The tickets to be counted are held against the feed roll which sends them through the machine one at a time. The machine is provided with two counters: one which can be reset to zero at any time by the pull of a lever, and the other which is for the purpose of recording the total count.

COUPON-PRINTING MACHINES²

The first use of coupon-printing machines was as a means of speeding up the work of filling in piece-work coupons. From this application the use was extended to production control, so that it is now used to advantage in that connection, as it visualizes the status of every order in the factory and shows continually the location of all work in process. Illustration A of Figure 269 gives an idea of the size and construction of the coupon-printing machine. Rate schedules, which are controlled by keys on the right-hand side of the machine, are set up on bars with removable type. The type that prints other information, such as the order number, lot number, size, or other pertinent information is constant.

In adapting the machine to the work of any industry a production ticket is first designed to meet the individual operating requirements. This ticket comprises a stub, which carries data regarding orders, jobs, or lots—style, rate schedule, quantity, and other information needed for office payroll and accounting control—and a series of scored coupons.

¹Manufactured by such companies as The Tickometer Company and leased by The Tickometer Company.

²Manufactured by such companies as The Tabulating Machine Company.

As many as 104 coupons can be provided, depending on the requirements of each individual industry. On these coupons such information as lot number, style number, quantity, and rate of pay is indelibly printed by the machine with specially designed type, each class of information be-

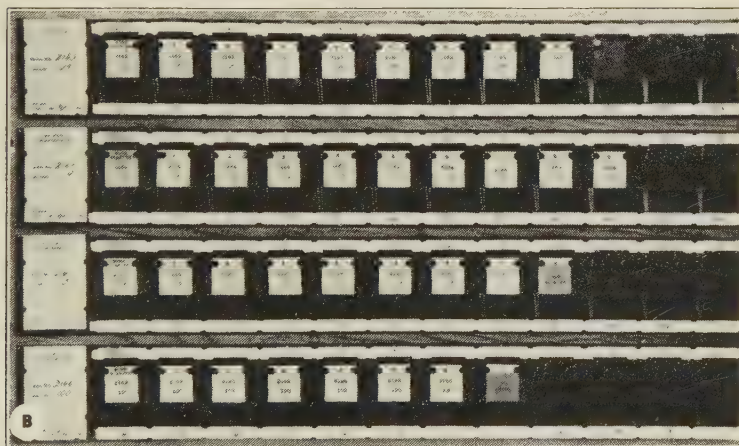
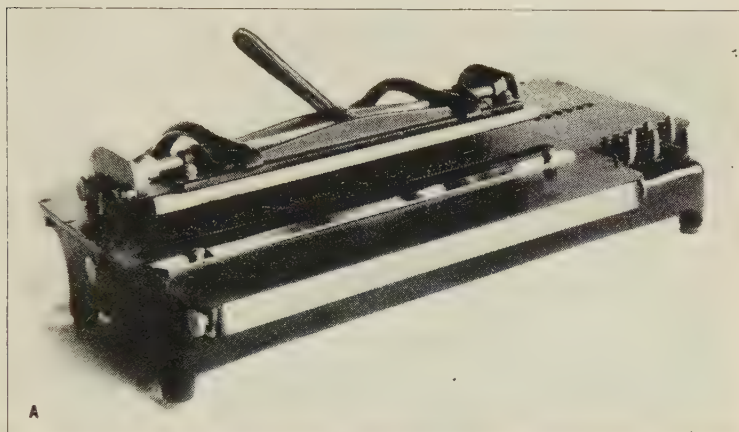


Figure 269: The coupon-printing machine provides a positive means of supervising work in process. The production indicator or chart illustrated by B together with the machine illustrated by A makes it possible to trace and to locate immediately any order. Read pages 590 to 595 for a detailed account of how these two interesting devices are operated.

ing printed simultaneously on the stub and all coupons. Even though each coupon may call for a different rate of pay, merely one pressure of a lever simultaneously prints all the various rates on the ticket.

After estimates for an article have been decided upon, the piece-rate price for each operation is set up in the machine, which is so constructed that it is impossible for these prices to be disturbed; hence, it eliminates the need for checking. As many as 84 complete price schedules can be printed by one machine.

A book made up of coupons can be used for the convenience of both the employee and the accounting department. By arranging the amounts consecutively, the handling of the coupons is simplified.

The method of controlling production through the use of this device is a positive means of supervising work in process, having as the basis coupons printed by this machine and the "production indicator" (see illustration B of Figure 269). This indicator is composed of a series of

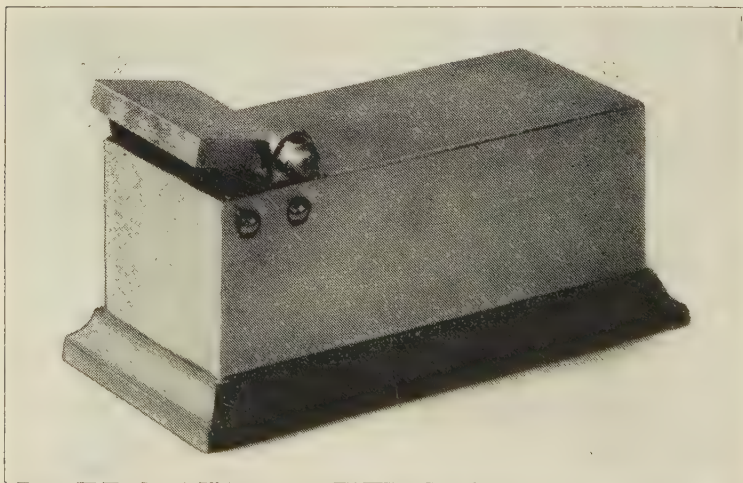


Figure 270: By means of this device, envelopes may be quickly moistened. The container is filled with water and the envelope is inserted. As it is pulled through, the flap is moistened. See page 595.

pockets for holding the detached coupons in such sequence that it visualizes the progress of every order in process. To the left of each series of pockets is a space for the control card which contains a description of the order as scheduled. The numbers above the pockets correspond with the departments or operations through which the production is scheduled. The production date appears below the pocket for



Figure 271: It is a simple matter to bind paper of all kinds when an eyelet machine such as this is used. A handful of eyelets is poured into the device. Automatically it feeds the eyelet and in one operation punches the hole and crimps the eyelet. See page 596 for further details.

each department or operation. The shop order entered on the manufacturing department is the basis for making up the production ticket; one coupon is allotted to each operation or department through which the work must pass. The coupons are printed by the machine, each class of information being printed simultaneously on all coupons.

When work is started on a job, the first coupon is removed from the shop order and placed in the first, or "work started," pocket of the series allotted to that particular job. At the conclusion of each operation, the coupon governing the work just finished is detached and placed in a container located conveniently in each department or section of the plant. At specified intervals these coupons are collected by the production clerk and inserted in their respective pockets on the production indicator.



Figure 272: There are three units of the scrubbing system. In the foreground is the scrubbing machine, next in order is the water absorber or mopping machine, last is the mop truck. Large office floors crowded with furniture, or spacious open floors, can be covered quickly, efficiently, and untiringly with equipment such as this. Similar equipment for polishing floors can be obtained. See page 596.

When work is delayed, a red card, marked "production delayed," is inserted in the indicator pocket referring to that particular order; when production is advanced or ahead of schedule, a green card, bearing the legend "production advanced," is inserted in the proper pocket with the last coupon filed; orders still in the plant, but upon which work has been stopped, are represented by a blue card reading "stop order."

This machine assures speed, accuracy, and economy in one of the most important branches of factory management. It not only prints the coupons many times faster than a clerk could write them by hand, but it also eliminates the need for checking and copying—which effects an immediate saving in clerical expense. Furthermore, the method of controlling production eliminates the tracing of orders, as all orders can be located immediately on the indicator. By means of this indicator the production manager can quickly visualize production and regulate its flow. For these numerous reasons the coupon-printing machine has won for itself an important place among office appliances.

ENVELOPE MOISTENERS¹

The small hand-operated envelope moistener handles, in an efficient and speedy manner, the tedious job of sealing envelopes. Figure 270 shows an envelope moistener of this kind. As the picture indicates, the device is very simple in operation as well as construction. It consists of a non-rust water container and a brush moistening device. As the flap of the envelope is whisked through the device, the moisture is spread on automatically between a rubber-set brush and a gravity pressure plate. The device is so small and simple that it can be used on desks wherever envelopes must be sealed. And thus it eliminates the necessity of moistening envelopes by means of the sponge. It offers a quicker, more

¹Manufactured by such companies as Better Packages, Inc.

efficient method of handling a few letters at a time, or numerous letters.

EYELET FASTENERS¹

The binding of all kinds of valuable papers, briefs, contracts, manuscripts, samples of cloth; the eyeleting of tags, leather, clothing, such as skirts and belts; the fastening of tags on samples of cloth and other fabrics; and the sealing of pay-envelopes, packages, and so forth, may be accomplished by means of a small device known as the eyelet fastener.

There are two types of eyelet fasteners, the hand eyeleter and the automatic eyeleter. The hand eyeleter is valuable where speed and quantity of work are not necessary factors. One eyelet at a time is placed on a spring collet and the eyeleter punches the hole and crimps the eyelet in one operation. Some hand eyeleters are equipped only with a punch and require that the hole be perforated before the eyelet can be inserted. The automatic eyeleter machine is valuable where continuous eyeleting is to be done. It feeds the eyelet, punches the hole, and crimps the eyelet in one operation. The illustration in Figure 271 gives an idea how this eyelet machine is constructed.

The eyelets are poured into the hopper, the article to be eyeleted is slipped between the device at the base of the machine and the lever handle is depressed. When continuous eyeleting is necessary, a machine of this type is almost indispensable.

FLOOR-SCRUBBING AND POLISHING MACHINES²

For scrubbing and polishing the floors of offices, public buildings, institutions, and factories, a scrubbing machine is of great value. A scrubbing system usually consists of three

¹Manufactured by such companies as The Bates Manufacturing Company.

²Manufactured by such companies as Finnell System, Inc.

units—scrubber, water-absorber, and truck (see Figure 272). The scrubber scours the dirt loose from any type of flooring or floor covering. The dirt is lifted from the floor by the water-absorber or a mopping machine. The wiping or drying, after the scrubber and absorber have been used, is done with a clean mop which is kept well laundered in the mop truck. The truck is a two-compartment affair to keep the dirty water and the clean water separated, and is moved from one position to another by hand. The other units of the system, however, are operated by electricity.

There are a number of systems, ranging from small machines capable of running under anything 6 inches from the floor, with a brush ring of 230 revolutions per minute and a diameter of 12 inches, up to the large machines designed for the open spaces with a brush ring of 24 inches in diameter and 144 revolutions per minute. In this range of models will be found a system that will take care of floors of any and all kinds under any and all conditions. Most of these models can be used for waxing and polishing floors wherever the need is felt for this kind of maintenance. Polishing or waxing machines are designed to run under furniture and fixtures 6 inches from the floor with 4 to 5 brushes forming a circle from 12 inches to 18 inches in diameter, with from 144 to 230 revolutions a minute. These machines are available for polishing and waxing all kinds of floors or floor coverings such as linotile, linoleum, cement, terrazzo, rubber, or wood.

FOLDING MACHINES¹

In offices where a large amount of mail or circularizing material is handled, the process of folding is a matter of no small consideration. The answer to this problem is the folding machine.

There are many different models, but all follow the same

¹Folders of this type are made by such companies as The American Multigraph Sales Company; The Liberty Folder Company; C. R. and W. A. Nelson, Incorporated.

general principles. The machines are operated either by hand or by electricity, and are made in two sizes—that is, the small size which may be placed upon the desk or table and the large size which stands upon its own pedestal. The power-driven machine may be easily controlled by means of an ordinary electric switch.

To operate the machine, the paper is placed on a shelf-like rack and is held in place under two levers. The switch is turned, and automatically the sheets are fed into the machine. Any ordinary commercial fold can be obtained with this machine. As the sheets are carried into the machine they are pressed into the fold by a lever or knife which drops between bars or rollers; from the first position the paper is carried into the second and third, or as many folds

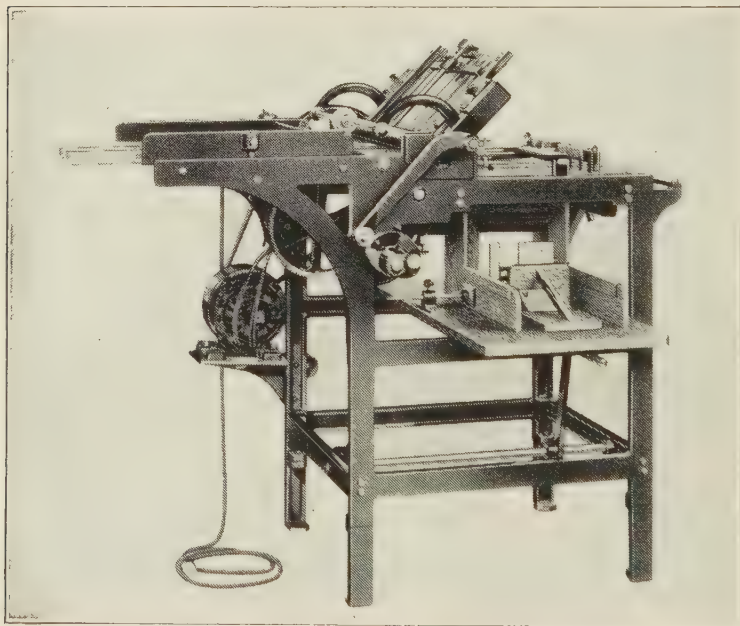


Figure 273: Five different kinds of folds can be accomplished at a speed of 3,000 an hour with such machines as this. All types of office papers, such as letters, invoices, circulars, may be folded rapidly and with a minimum amount of effort. Read above how this machine is operated.

as the capacity of the machine allows. The machine may be set for as many folds as desired, adjustment for the number of folds being accomplished by lever attachments. When the sheet has completed its course through the machine, it is shot out of the machine on to stacker bars, which catch and stack in order all the material folded.

Figure 273 shows a model which is power-driven and equipped with an automatic feed. This machine makes five different kinds of folds at a speed of 3,000 an hour, the maximum size of paper being 9 by 15 inches and the minimum $2\frac{1}{2}$ by 5 inches. It is especially designed for office use, with the widest scope of its work being the usual letters, invoices, and other "run of mail" found in the average office. Another model, made by the same company, which is built on a larger scale and which has a capacity of 5,000 pieces an hour, is designed for the folding of letters, circulars, and booklets. The maximum size sheet is 12 by 17 inches and the minimum $5\frac{1}{2}$ by 8 inches.

There is a still larger machine which folds from 5,000 to 15,000 sheets an hour, according to size, and which makes one or two parallel folds in sheets ranging from $5\frac{1}{2}$ by 6 inches to 11 by 27 inches. It is built in two models—the semi-noiseless for ordinary work, and the noiseless, where extreme quietness is required, as, for instance, in banks, private offices, and the like.

Another model folds at a constant speed of 6,000 sheets an hour, regardless of size or the number of folds. This machine may be operated by hand or motor power and makes one, two, or three folds in a combination of right-angle or parallel folds, handling all style letters, price-lists, bulletins, broadsides, monthly statements, covers, pamphlets, small booklets, and envelope enclosures.

IMPRINTING PRESSES¹

An imprinting press for office use answers many particu-

¹Manufactured by such companies as Golding Manufacturing Company.

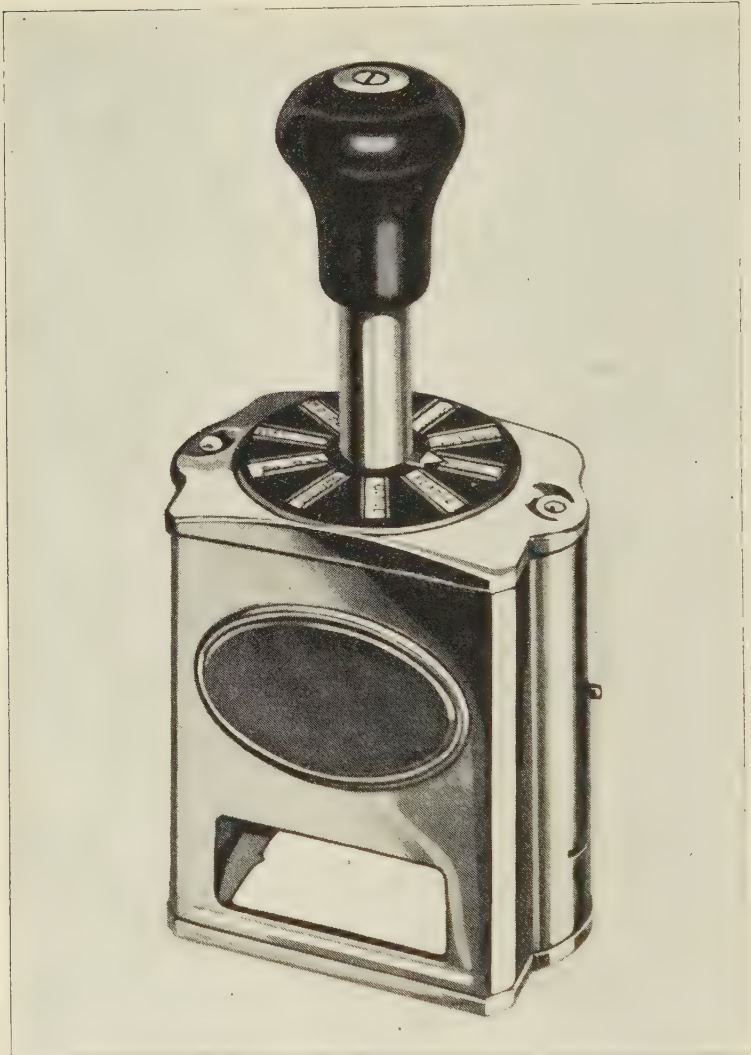


Figure 274: The multiple stamp offers 10 different impressions and affords a means of selecting the impression desired. Ten plates of dies on a revolving cylinder are encased in a frame upon which a plunger operates. As the indicator is turned to the impression desired, the plate revolves to the stamping position. Note the index which offers a means of selection.

lar needs. Frequently a small hand imprinting press is particularly valuable for imprinting drawings, titles on all tracings and blue-prints. It is also used on various other materials.

There are two kinds of this type of press: the hand-operated press and the motor-power press. In each case the machine is equipped with a stationary platen. This means that when the machine is in operation the bed containing the printed form is carried down to the stationary platen. Such an arrangement makes it possible to handle a great variety of materials, such as, rubber inner tubes and other rubber goods, wooden handles, and novelties which would otherwise be difficult to handle. The speed of the press and the simplicity of the operation further add to efficiency wherever it is used.

MULTIPLE STAMPS¹

The multiple stamp affords 10 different impressions, together with a means of instantly selecting the impression desired. Ten plates of dies on a revolving cylinder are encased in a frame upon which a plunger operates. At the top of the frame is an index showing the plates which the stamp holds (see Figure 274). As the indicator is turned to the impression desired, the plate revolves to the stamping position. From one to three lines are possible on each stamp, and an interchangeable index is provided so that different combinations of stamps may be used. More than 50 standard plates are available for insertion in the cylinder, and special plates may be obtained. The plates are self-inking, ready for use, and the ink container may be refilled when necessary.

NUMBERING MACHINES²

Whenever there is numbering to be done, a numbering

¹Manufactured by such companies as Stamplex Corporation.

²Manufactured by such companies as American Numbering Machine Company; The Bates Manufacturing Company; William A. Force and Company, Incorporated; The Roberts Numbering Machine Company.

device can be used to advantage. In practically every office there is a certain amount of numbering, and for this fact the numbering machine has become almost indispensable for such work as numerical indexing systems, filling in orders, preparing job tickets and tags, and for accounting, pay-roll and cost systems, and other work of this kind.

The hand numbering machine prints numbers by means of small wheels which are designed for type varying in number from 6 to 20 characters. These wheels are set upon a plunger in a frame. As the plunger is depressed the type-wheel prints the figures on the paper or article. Ink is fed to the type by means of a felt pad. There are various styles and models, from the light card-printing devices to the heavy metal-embossing power machines. In some cases the numbering machine may be combined with word- or date-stamping devices. In that case special indicia may be used, as, "Paid," "Received," dates, trade-marks, or brands.

The devices in Figure 275 illustrate numbering machines which are furnished with numerous combinations

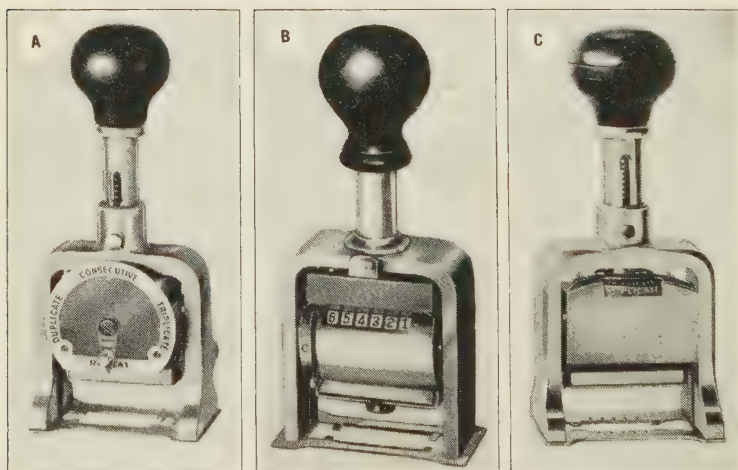


Figure 275: As the numerical system is applied to numerous kinds of businesses, the hand numbering machine, constructed to number consecutively, duplicate, triplicate, and repeat, holds an important place in the office.

of movements. These devices are usually arranged to number consecutively, duplicate, and repeat. There are also four-movement machines; that is, machines that number consecutively, duplicate, triplicate, and repeat.

A numbering machine which is sometimes called semi-automatic, or lever-operated, is equipped with a lever the operation of which changes the number to the next higher one. With the lever-type machine any number can be printed as many times as desired. Each pressure of the lever advances the unit wheel of the machine one figure in consecutive order.

Geared numbering machines are operated very much on the same principle as adding machines. That is, any combination of numbers can be brought into position by moving keys forward and backward to relative positions. There is a lever for each wheel and each is geared directly to the printing wheels.

The multi-action numbering machine is also semi-automatic, as pressure on the lever clears the partially completed series so that the machine will stamp the entire series correctly before advancing to the next number. This machine has 14 different actions on the outer dial and also indicates the number of impressions taken for each setting. The elimination lever makes it possible to correct errors made during the printing without resetting the action.

Motor-power numbering machines are used for embossing characters into metal, fiber, or wood. There are various styles of the motor-power numbering machines—especially designed for special types of work and materials.

It is interesting to note that a numerical system may be applied to a vast number of different kinds of businesses. For example, a simple accounting or bookkeeping system may be employed by means of a numbering machine. When this system is used the carbon-copies of all orders, bills, shipping receipts, charge memos, and so forth, are numbered with a numbering machine and filed numerically until

the originals have been executed. As the numbers of the copies are identical with those of the original, vouchers may be proved immediately at any time.

Other cost systems may be operated in a similar way. Job tickets can be numbered, the originals and all carbon copies being identical. As the work progresses, reports on the original can be entered on the duplicate in the file. And when the work is completed, the details on the original are posted on the duplicate and a voucher is sent to the invoice clerk.

A great deal of the work in banks and law offices is of such a nature that it is especially adapted to numerical systems. When the card-ledger or loose-leaf system is used in banks, each card or sheet is numbered corresponding to the pass-books. This system not only saves time, but makes it easier for the receiving clerk to compare the pass-book with the ledger when he issues receipts. The handling of the claims which come into a lawyer's office is greatly simplified by the numerical system. When duplicate or triplicate cards are made out with the details of each claim, the cards bear the same number as the folder or envelope which holds the papers of the claim.

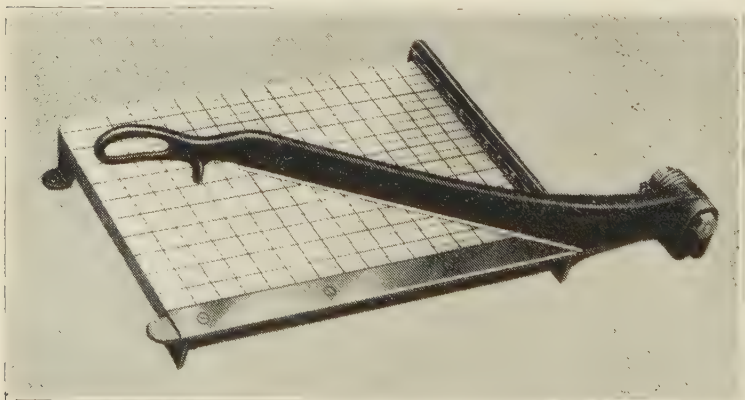


Figure 276: Shows the simple construction of the desk cutter. It is used chiefly for trimming single sheets, photographs, and the like.

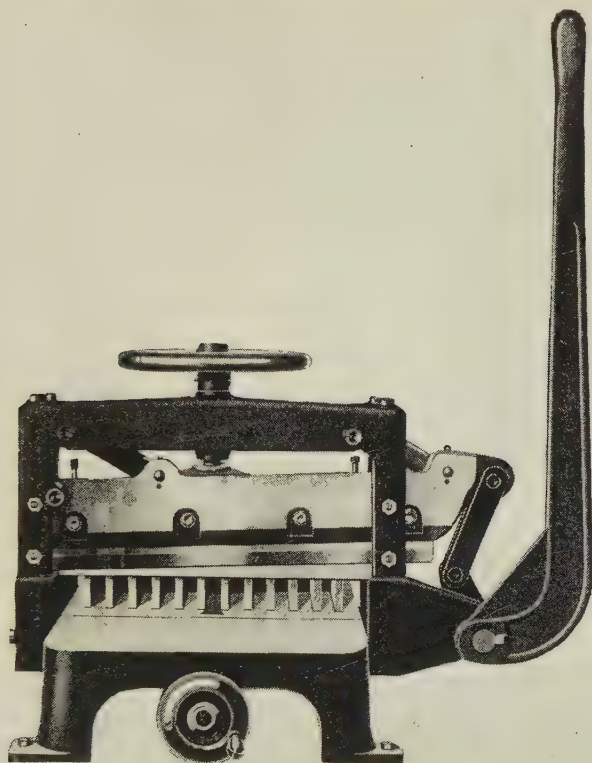


Figure 277: A hand-operated bench cutter used where heavy paper stock is cut. The hand wheel at the top operates the clamp.

PAPER-CUTTING MACHINES¹

In all offices where a large amount of paper is used, a paper-cutting machine is of great value, for with these machines great quantities of paper may be cut accurately and rapidly. Although one or more kinds of paper cutters may

¹Manufactured by such companies as The Challenge Machinery Company; Golding Manufacturing Company; Kalamazoo Loose Leaf Binder Company; Pavyer Printing Machine Works.

be used in practically every office, there are certain types of business which have a very great need for paper cutters. Printers, mail-order houses, publishers, wall-paper and sample book manufacturers, advertising agencies, insurance companies, banks, schools, and many other concerns and institutions use paper cutters extensively. So varied is the use that the types vary and many different kinds of cutters are manufactured to answer the different needs. It may be said for the purpose of this book that there are three kinds of paper cutters: desk cutters, hand-lever cutters, and power cutters.

Desk Cutters. A machine for trimming or cutting lightweight paper or small quantities of paper may be here called the desk cutter. It consists of a table or platform of

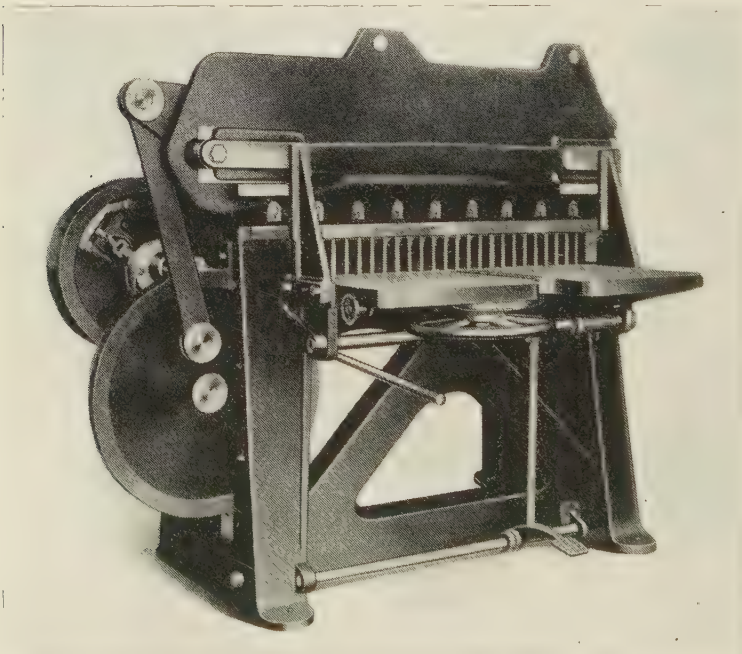


Figure 278: This motor-driven cutter is constructed to cut extra heavy stock. Material is held in place by a clamp. See page 608.

hardwood, ruled in gradation of one-inch squares for a convenient cutting guide at any point. A lever-like knife is attached at one side of the table and is operated by a spring back handle. Figure 276 shows how simply this type of cutter is built. Because of its simplicity in construction and operation it is especially well adapted to light work for the private office, the library, the accounting and filing departments, and the schoolroom.

Hand-Lever Cutters. The paper-cutting machine designated as the bench cutter handles much heavier work than the desk cutters, and is used by factories, printers, and concerns which use a large supply of paper. The bench cutter as pictured in Figure 277 is hand-operated. The machine consists of a metal platform or table, on which the material to be cut is placed, and a large lever which operates the cutting knife. The hand wheel at the top of the machine shown in the illustration operates the clamp which holds the paper in position for cutting. The knife is hung from two swinging links and is of proper length to give the greatest

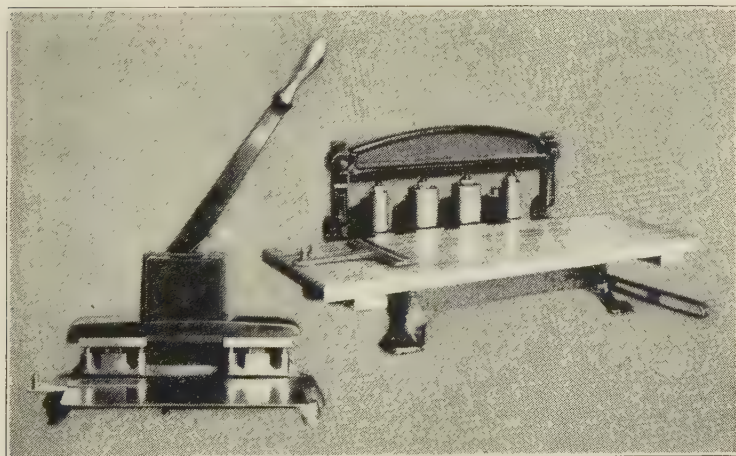


Figure 279: Here are two paper punches. There are several kinds of machines to handle the many needs for efficient paper punching. For a description of these machines, see page 608.

possible leverage. A safety device locks the knife, so that it cannot fall while the material to be cut is being adjusted. It is constructed so that it is released by the left hand while the right hand is on the lever ready to make the cut. The bed or table is marked with a scale both in back and in front of the cutting line to act as a guide.

Motor-Driven Cutters. There are two kinds of motor-driven power cutters: the hand-clamp and the automatic-clamp cutters. The motor-driven cutter is based upon the same principle as the hand-power paper cutter. The chief difference is that the motor-power machine is constructed to handle very heavy work and does the work much quicker. Figure 278 represents an automatic-clamp motor-power paper cutter. It is interesting to compare this machine with that illustrated in Figure 277.

The automatic-clamp machine holds the paper securely in place automatically, that is, the pressure exerted is in direct proportion to the power required to cut the paper. The automatic clamp precedes the knife, to hold the paper while the knife goes through it, otherwise the pile of paper, being cut, would slip out of place.

PAPER PUNCHES¹

There are a great many kinds of paper punches, but for the purpose of this book it may be said that there are two types: single hand punches and multiple punches. The small single hand punch is very simple in construction and in operation. The plier-like instrument is held in the hand and the article is inserted between the collets of the punch. By pressing the levers together a perforation is made.

Multiple punches cut more than one hole in one operation. There are numerous kinds of multiple punches, which

¹Manufactured by such companies as The Bates Manufacturing Company; The Challenge Machinery Company; Kalamazoo Loose Leaf Binder Company; C. R. & W. A. Nelson Company; Proudfit Loose Leaf Company.

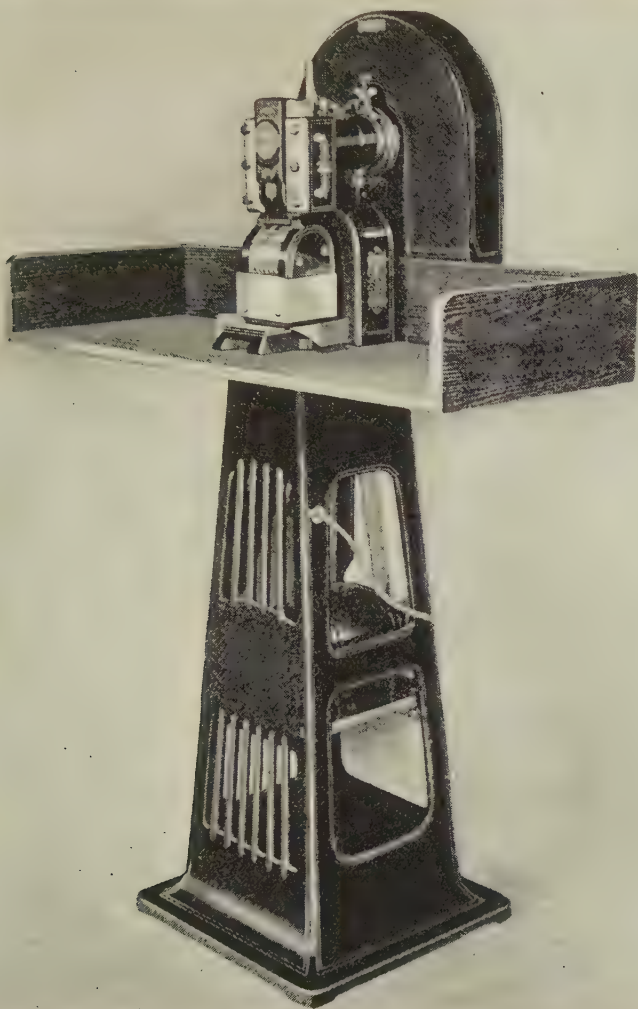


Figure 28o: The perforating machine shown here is motor-driven. There are numerous types of perforators, as their use is wide and varied. In every case, however, the principle of perforating is practically the same. Punches and dies are carried on figure and letter wheels. A separate die is required for each operation; therefore, the arrangement of dies in groups and lines forms the characters.

may be operated by hand or by motor power. The multiple hand punch is made in many different styles. Adjustable multiple hand punches are illustrated in Figure 279. The punching heads held in a grooved slot may be slipped along the rod to any desired position.



Figure 281: This very unique device receipts the bill and stub, cuts the stub from the bill, and deposits the stub, all in one operation. The impression illustrated indicates how the information is imprinted and how the ticket is cut. For further interesting details, see page 612.

The power multiple punching machine handles all heavy work. With its various attachments it accomplishes, at a high rate of speed, the following operations: punching, die-cutting, perforating, round cornering, tab cutting, label cutting, and embossing.

PERFORATING MACHINES¹

Perforating machines have a very wide use; therefore, many models are now on the market specially designed to effect the most efficient manner of perforating for all kinds of work. There are perforators which are used for canceling checks, bonds, revenue stamps, notes, and drafts, and those which are used for marking articles of all kinds, as hat-bands, films, tags for laundries, cleaners, and dyers. Perforating machines are also used for dating and numbering. Packers of all kinds of food products perforate dates on their labels; railroads use perforators for dating tickets. In addition to these various applications, perforating machines are used for many other purposes, such as, for instance, canceling invoices when paid; dating incoming mail; numbering floor sheets, factory and office orders; numbering sales tickets; validating passes and coupons; perforating to show that bills have been entered, audited, or paid; marking company-bought postage stamps.

There are three types of machines for effecting the perforations—hand, foot, and motor-driven. The perforating principle of each of these, however, is identical. Dates, numbers, and so forth, are set for the desired characters, by merely turning the various wheels. The material to be perforated is slipped into the opening of the die. The motor-driven perforating machine is illustrated in Figure 280. The hat-band perforator has a dial indicator upon which the letters are marked. This dial is turned to the desired letters and the handle is depressed.

¹Manufactured by such companies as The American Perforator Company; Cummins Perforator Company; F. P. Rosback Company.



Figure 282: This machine prints the lot number, stock number, size, manufacturer's name, invoice number, and price in one operation. The information varies to fit any particular case. With this machine one operator can do the work of six persons marking tickets by hand. See page 613.

RECEIPTING-COUPON CUTTERS¹

The receipting-coupon cutter is a unique machine which receipts bill and stub, and cuts the stub from the bill in one operation. Figure 281 gives an idea of the appearance of the receipting-coupon cutter. The stamping and cutting devices are mounted upon a base which is equipped with a key-lock drawer. The stamping device, which is suspended from a frame acting as a lever or plunger, makes two impressions. One stamps the word "Paid," the date, and the index number. The other stamp prints the same information, usually giving in addition the name of the person by whom the bill is receipted, as, for example, "J. C. Brown, Treasurer." These receipting stamps are very similar in construction to numbering machines. The type is inked by a felt pad and may be changed daily.

The card or paper bill to be receipted is placed upon the top of the cabinet, as shown in the illustration, and the lever is swung down, thus receipting the bill, canceling the stub,

¹Manufactured by such companies as Jas. H. Matthews and Company.

and cutting the coupon. The cutting of the coupon is effected by a small knife-like lever which descends as the lever swings down and at the same time the coupon is deposited in the drawer, hence only one operation is required to perform all functions.

Any firm or individual having quantities of card or paper bills to receipt will find the receipting-coupon cutter a great time-saver. The receipting-coupon cutter is especially valuable to such companies as ice companies; gas, electric, and water companies; city and county tax departments; clubs, lodges, and fraternities; and, in fact, any concern handling receipts in card or paper bill form. Coupons are sometimes receipted by machines which perforate¹ the data.

TELEPHONE INDEXES²

Wherever there is a need for keeping a long list of telephone numbers the telephone index adequately fills that need. To do away with the necessity of looking through a directory for numbers frequently called, this device saves the busy man's time.

The index consists of a metal case in which a paper roll is placed. By turning the knob at the side the roll is run past the opening at the top. A red line of letters, corresponding to the letters at the top, automatically show the position of the name with other information.

For ordinary use a small index with space for 720 names is sufficient; for switchboard work a larger one containing space for 2,100 may be used.

TICKET-MARKING MACHINES³

In one operation the machine shown in Figure 282 prints

¹Devices of this type are manufactured by such companies as The American Perforating Company.

²Manufactured by such companies as The Bates Manufacturing Company.

³Manufactured by such companies as The Monarch Marking System Company.

the lot number, stock number, size, manufacturer's name, invoice number, and price. This information varies to fit any particular case. For instance, the house number, season, or department may be used instead of the previous data. The system eliminates the possibility of several articles in any lot being incorrectly marked. With this machine one operator can do the work of five or six persons marking tickets with pen, pencil, or hand stamp. In addition to the economy of time, the ticket-marking machine mitigates the possibility of incorrect and illegible price-marking.

The machine is equipped with a small electric motor (either alternating or direct current) consuming in operation about the same amount required to light an ordinary incandescent lamp.

The operation is by means of "direct worm drive," no belt or chain being used. The type is of special construction and fitted to the type chase, each character independent of the other, requiring no locking-up form for printing. The type is set from left to right, exactly as characters would be written. The model shown in the illustration will price-mark six different sizes of pin tickets, six sizes of merchandise tags (string), nine sizes of hosiery or glove tickets (sew-on style), and six sizes of gum labels. The speed capacity is 120 tickets a minute.

XXXII

SAFE-KEEPING RECORDS

Significance of business records. Three fundamental hazards. Value of the record. General specifications for safes. Vault protection. Storage and supply cabinets. Safety-deposit boxes. Value of protecting records.

WHEN a merchant, thousands of years back, employed a corps of stone-cutters to chisel his accounts on slabs of granite, the protection of his records was a matter of very slight importance to him. When records began to be kept on paper, not to mention the other combustible materials which preceded it, the loss to business from fire had its inception.

The earliest attempts to provide safe-keeping, however, were directed specifically against theft. The property to be protected was not records, but treasure—gold, jewels, and other wealth of a sort most easily stolen, carried away, and converted to the uses of the thief.

Today, in the average business, the protection of money and similar property is of far less significance than the protection of records. Compared with the financial loss which would follow the destruction of its records, the amount of coin or currency which might be lost in a robbery is of little importance to the average concern. Banks and other institutions have been set up to handle the money, and in most businesses comparatively little cash is handled.

Few business organizations work on a scale which permits of any one person or group of persons keeping in mind the essential facts which must be used in the transaction of the concern's commerce. And when a business loses its records, it has in large measure lost control of its assets and their protection.

The records of business largely represent, govern, and

control the more tangible properties. Yet these records are the easy prey of fire and theft, and, in general, they cannot be insured. Protection against their destruction has, therefore, become of prime interest to business men.

The modern safe and safety-deposit box offer a most comprehensive system of safeguarding valuable records and documents, as well as the more tangible forms of wealth. That is why the business man of sound judgment fittingly considers them among the most important equipment in his business.

By no means is it necessary, in this chapter, to go into the history of the development of the modern safe, from its beginning as a metal-bound wooden chest to its final flowering in the huge, armored, mechanically and electrically protected vault of the metropolitan bank. With neither of these safe-keeping containers is the average business man immediately concerned.

He wants to know, in the fewest words: "How can I protect my valuables and my essential records, effectively?" His interest is not in history, nor in the technicalities of construction. His crowded time concentrates his attention on the equipment which will best perform the job which is required in his business.

If, for example, he takes in a large amount of money in the evening after the banks and safe-deposit vaults have closed, or on Saturday afternoon or Sunday, he wants to protect this cash with the container which comes nearest to being burglar-proof as well as fire-resistive. A safe foils the casually dishonest individual who has the inclination and ability to jimmy a window; it puts additional difficulties in the way of even the skilled safe-blower; and, what is quite as important to the thoughtful executive, it enables him to carry burglar insurance at a reasonable rate—depending on the rating accorded his container by the insurance companies. If money is burned owing to the inadequacy of the container in which it is kept, such a loss is not covered by insurance.

The insurance problem in connection with safes should be given serious consideration. As every business man must realize, insurance is a two-sided proposition—the insured, as well as the insurance company, has obligations which must be fulfilled. In short, it is up to the business man to be assured that his record protection is adequate and also to determine just what the insurance policy covers.

THREE FUNDAMENTAL HAZARDS

In determining the amount of protection needed, there are several points which require consideration. First, there are three important factors which may be called the three fundamental hazards. These are all “external” considerations, as they are in view of the building in which the business is located: (1) the kind of building; (2) the kind of occupancy; (3) the surroundings. The first point brings up the important factor of construction. The type of building construction determines to a large degree the probability of



Figure 283: It is to guard against just such disasters that the fire-proof safe is needed. Every business has records the loss of which makes it practically impossible to continue business. When the fire comes, it is too late to regret the inadequacy of record protection.

fire. This point in connection with the kind of occupancy of the building gives a further clue to the fire hazard. Although the construction of the building in which the business is located may indicate very small probability of fire and although the kind of occupancy of the building does not enlarge this probability, the surroundings may change the entire outlook. For example, a highly inflammable building close to a fire-resistive building is likely to make advisable a higher degree of record protection inside the fire-resistive building than would be needed if the abutting buildings were all of modern fire-resistive construction. Each one of these three points links up as an important factor in record protection.

VALUE OF THE RECORD

It is such a disaster as illustrated in Figure 283 that every business man must guard against. There is one, and only



Figure 284: Safes are submitted to these two scientific tests to determine their ability to withstand fire and impact. Papers are placed within the safe, the safe is then heated to a certain degree, dropped several feet, after which it is reheated. When the safe is opened, the papers must be in good condition or the safe fails to pass the test. See footnotes 1 and 2, which begin on pages 622 and 623, respectively.

one, solution to this problem—adequate record protection.

The records to be protected offer a further important step in the consideration of record protection: their indispensability; their intrinsic value; their privacy; and their cost of replacement.

There are records of all varying degrees of value. Every business has its own valuation of records. In general, negotiable records such as money and securities (as bonds, contracts, and so forth) are classified as of vital importance. Records the loss of which does not cause any inconvenience in business may be classified as non-essential. Then, there is a large bulk of material which is of sufficient value to be worth protecting, but which can be replaced if need be. This material may be divided further into two classes—important records and useful records, depending upon the difficulty and expense of replacing them.

A classification along this line of reasoning suggested by

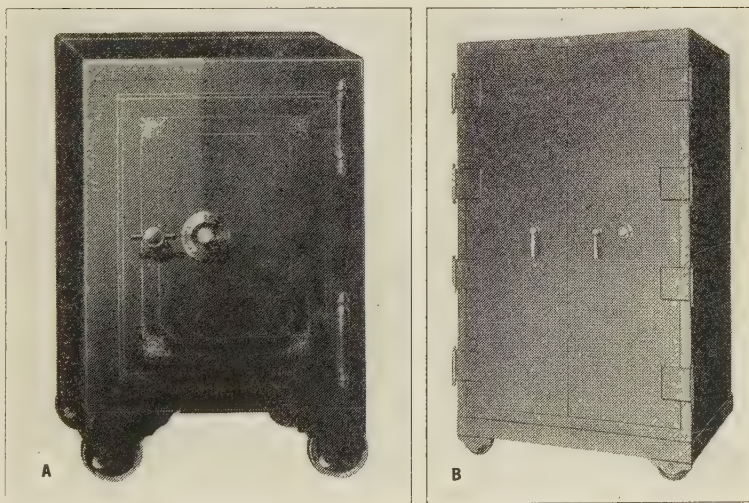


Figure 285: Two closed safes illustrating a one-door type and a two-door type. This figure further indicates how safes are constructed so that neither flames, smoke, water, nor gases can seep through to their interiors. See page 624.

the National Fire Protective Association is of great assistance as a solution to individual problems of record protection. The classification has been worked out as follows:

Class I—Vital Records

Class II—Important Records

Class III—Useful Records

Class IV—Non-Essential Records

To explain a little further in detail these groups may be said to include the following records:

Class 1—Vital Records. In this group will be placed, usually, such records as charters, franchises, minutes of directors' meetings, deeds, abstracts, options, stock transfer and bond records, important contracts, general books and supporting papers, accounts receivable, tax returns, and many other accounting records. Here may be found also many engineering records, such as drawings and tracings, property plans, appraisals, inventories, and the like. Numerous other items of similar importance will be discovered upon examination.

Class 2—Important Records. In this class will be placed many statistical studies, derived accounting records, which could be reproduced again from the original sources, if necessary, though at considerable expense and labor. The great mass of operating records usually belong in this group, particularly those of informative character whose purpose is to maintain a check upon efficiencies, operating costs, and so on. Minor contracts and similar papers are included. In general, Class 2 covers those records not important enough to be placed in Class 1, but still clearly more valuable than those in Class 3 described below.

Class 3—Useful Records. Service records are perhaps the best illustration of this group. Their loss would occasion much inconvenience, but, with a few exceptions, would present no insuperable obstacle to the continuous operation of the business.

Class 4—Non-Essential Records. This includes principally the material which upon examination is deemed eligible for destruction.

The above examples, it must be remembered, are illustrations only to show how the classification may be worked out. There are many other records which might be in-

cluded. Every business, regardless of character, presents a distinct and different problem.

The facts, then, to be considered in determining the amount of protection needed are concerned with external conditions and the records to be protected. When the business man knows exactly where his own problems fit into these classifications, it is time to ascertain what kind of safe will meet his needs.

Steadily, since safes were first built, they have been improved. The need has been, of course, not only for better safes, but for safes with heat and theft resistance and strength of construction which are determined and known. As cities and towns developed, buildings became larger and

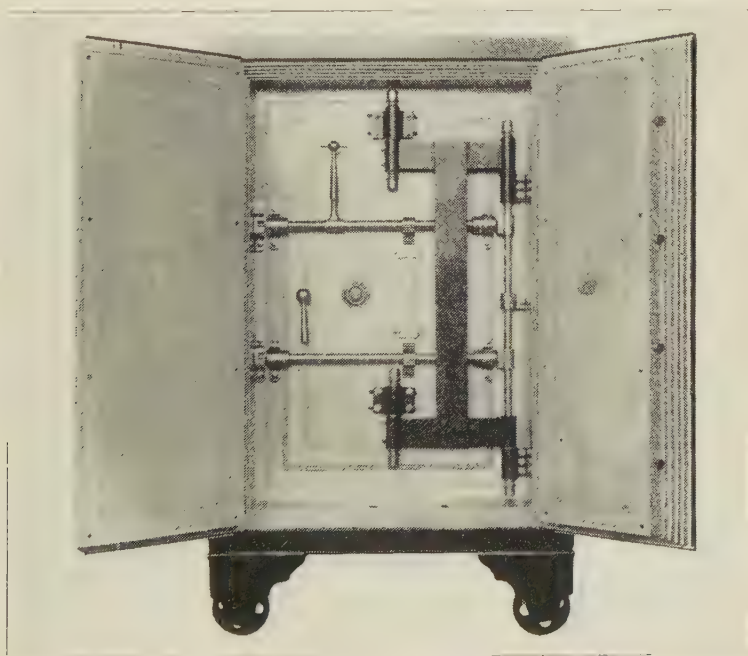


Figure 286: In addition to fire protection comes a vastly important problem in burglar protection. The interior door of the safe above illustrates one type of locking device.

higher, so that with the danger of fire also came the danger of safes falling from the upper floors of high buildings. This strain often proved too severe for the construction of some of the earlier types, and proved that safes must be constructed to withstand the strain of falling.

Early in the twentieth century there came into existence scientific research organizations¹ which began to study safes for the purpose of determining with impartiality their ability to resist heat, impact, and theft. In order that scientific testing might be of value, it was necessary to set up standards covering the fundamentals of protection which a practical safe should afford. Tests to determine strength of construction and fire-resistance have greatly aided in setting up these standards. Illustration A of Figure 284 shows the explosion test, while illustration B of the same figure demonstrates how safes are dropped to test their ability to withstand impact by falling.

Although tremendous progress has been made in the manufacture of safes, there is still a good deal of debatable

¹Scientific research has brought out some exceptionally valuable information on safe-protecting records. The National Fire Protective Association has carried on extensive research along this line. The Underwriters' Laboratories, Inc., maintains a system of inspection which serves as a continuous check upon the standards of manufacturers. The object of the Underwriters' Laboratories is, as they state in their "Organization Purpose and Methods" booklet, "to bring to the user the best obtainable opinion on the merits of appliances, devices, machines, and materials with respect to life, fire, and collision hazards, and theft and accident prevention." When a safe is submitted to the Underwriters' Laboratories it is put through a series of severe tests.* The results of the tests determine the classification. According to this plan insulated safes and cabinets are classified as follows:

Class A: Safes bearing Class A labels are effective in withstanding: (1) severe fire (reaching 2,000° F.) for at least four hours before interior temperature reaches 300° F., (2) an impact due to falling 30 feet in the clear after being heated for one hour (reaching 1,700° F.) and re-heating as before impact in the inverted position, (3) an explosion test to determine whether a sudden heating will cause an explosion in the walls or interior.

Class B: Safes bearing Class B labels are effective in withstanding: (1) a severe fire (reaching 1,850° F.) for at least two hours before interior temperature reaches 300° F., (2) an impact due to falling 30 feet in the clear after being heated for one hour (reaching 1,700° F.) and reheating

(Footnote continued on the next page)

*Any reader interested in the process of testing safes will find a most interesting account in "The Truth About Testing Safes," recently published by the National Association of Steel Furniture Manufacturers.

ground among the experts. Each of the various makes has its special features.¹

It is interesting to note that a wide-spread influence has been exerted by the efforts of impartial organizations and of manufacturers in maintaining large research departments and in conducting scientific tests to predetermine the abilities of safes to withstand the fundamental hazards. So great has been this influence on industry that the Bureau of Standards of the United States Government has established definite specifications² for insulated steel safes and cabinets.

(Footnote continued from preceding page)

as before impact in the inverted position, (3) an explosion test to determine whether a sudden heating will cause an explosion in the walls or interior.

Class C: Safes bearing Class C labels are effective in withstanding (1) a severe fire (reaching 1,700° F.,) for at least one hour before interior temperature reaches 300° F., (2) an impact due to falling 30 feet in the clear after being heated for one hour (reaching 1,700° F.) and reheating as before impact in the inverted position, (3) an explosion test to determine whether a sudden heating will cause an explosion in the walls or interior.

Insulated Cabinets: Insulated cabinets bearing Insulated Cabinet labels are effective in withstanding fire of moderate severity (reaching 1,640° F.) for at least 45 minutes before interior temperature reaches 300° F.

As a means of designating the classification of safes which have been submitted to the tests, a label service is provided. The result of the tests upon the safe determines the class label which is then awarded. Such a policy sets a standard for both manufacturers and buyers.

¹Safes are manufactured or jobbed by such companies as Art Metal Construction Company; The Berger Manufacturing Company; The Canton Art Metal Company; Cary Safe Company; Diebold Safe and Lock Company; The General Fireproofing Company; The Globe-Wernicke Company; The Hall's Safe Company; Herring-Hall-Marvin Safe Company; The Macey Company; The McCaskey Register Company; The Meilink Steel Safe Company; Metal Office Furniture Company; Miller Safe Company; Mosler Safe Company; The National Safe and Lock Company; Rand Kardex Bureau; Reliable Safe and Lock Company; The Schwab Safe Company; Shaw-Walker Company; Steel Equipment Corporation; Stiffel-Freeman Safe Company; Syracuse Safe Company; The Van Dorn Iron Works Company; Victor Safe and Lock Company; Yawman and Erbe Manufacturing Company; and York Safe & Lock Company.

²A résumé of the Government Specifications is given here:

Classification and Use: Insulated safes and cabinets are herein classified into three classes within each of two general types: Type 1, comprising those having a structural frame conforming with the requirements herein specified; and Type 2, those without such structural frame. The classes A, B, and C within each type are differentiated mainly by the degree of heat insulation

(Footnote continued on next page)

GENERAL SPECIFICATIONS FOR SAFES

Under modern office conditions safes should be as nearly fire-proof as possible. They should be so constructed that neither flames, smoke, water, nor gases can seep through to their interiors. (See Figure 285.) They should be so strongly constructed that they can resist rupture in a long fall, yet light enough for ready transportation. In addition to the insulated filling of the walls, the construction of safes must be rigid and solid. They may have a lock and bolt mechanism which offers the greatest possible amount of burglar protection. Note the locking device illustrated in Figure 286.

It should be observed that fire resistance and burglar resistance do not go together. Most good heat-insulators do not resist mechanical attack, while, on the other hand,

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afforded. The safes and cabinets shall be so constructed as to protect their contents when exposed to fire and impacts of the degree of severity incident with their proper location and use, and shall provide such lock protection against petty larceny as is consistent with the construction.

From the standpoint of heat insulation Class A of both types is recommended for use in buildings with large amounts of combustible contents, such as warehouses and stores; Class B where moderate amounts of combustible contents are involved, and Class C for occupancies giving light exposures, such as office or residential. It is recommended that with non-fire-resistive construction Class C be used only in buildings up to two stories on account of possibility of contact with too large amounts of hot material for a period after the fire in the higher buildings; also, the thicker walls of Classes A and B of both types are to be considered as contributing measurably to impact resistance.

In the use of each type or class, proper precautions must be taken where necessary to so locate the safes and distribute the weight as to prevent over-stress in the supporting floor members.

TYPE I—The following applies to safes not over 6 feet in total height.

Weight: Without interior equipment or contents:

Class A: shall not exceed 350 pounds per square foot of floor area.

Class B: shall not exceed 250 pounds per square foot of floor area.

Class C: shall not exceed 200 pounds per square foot of floor area.

TYPE II—The following applies to safes not over 6 feet in total height.

Weight: Without interior equipment or contents:

Class A: shall not exceed 250 pounds per square foot of floor area.

Classes B and C: shall not exceed 200 pounds per square foot of floor area.

General Requirements for both Types. 1: Structural shapes shall be of wrought iron or open-hearth steel, and plates and sheets of open-hearth

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special steels effective against burglar attack are excellent conductors of heat. Hence, where protection against both fire and burglary is desired, the solution lies in burglar-proof safes within fire-resistive vaults or smaller burglar-proof chests within fire-resistive safes.

Similarly, a business which has records and documents absolutely essential to its profitable continuance needs a safe which will protect these papers against the most severe fire.

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or Bessemer steel stock. All joints must develop the maximum proportion of the resistance of the metal, and be made to prevent undue openings when exposed to fire.

The insulation and design of the safe must be such as to prevent sweating, swelling, appreciable loss of insulating value with age, or disruption from explosion of gases generated within it when exposed to fire. The insulation must be molded, pointed, or reenforced as to preserve its form and insulating value when safe is subjected to fire and impacts.

THICKNESS OF METAL SHELLS:

Class A: Outer shell shall not be less than no. 14 gauge (0.078 in.). Inner shell not less than 16 gauge (0.0625 in.).

Class B: Outer shell shall not be less than no. 16 gauge (0.0625 in.). Inner shell not less than no. 18 gauge (0.05 in.).

Class C: Outer shell shall not be less than no. 18 gauge (0.05 in.). Inner shell not less than no. 20 gauge (0.0375 in.).

FIRE RESISTANCE:

Class A: Must be able to withstand fire test for 4 hours with interior air temperatures at critical points not higher than 177° C. (350° F.) either during or after the fire exposure.

Class B: Must be able to withstand a similar 2-hour fire test with same interior temperature limits.

Class C: Must be able to withstand a similar 1-hour fire test.

IMPACT RESISTANCE:

Safes of all types and classes must preserve their contents during a rehear test of one hour, following a clear drop of safe 30 feet while in a heated condition from an initial standard fire exposure of one hour.

BASE, DOOR AND LOCKING REQUIREMENTS:

Base Details: The safes shall be supported on heavy swivel casters with antifriction bearings, or on rollers.

Door Details: The outer surface of the doors shall be made to fit each other and the opening with no greater clearance than 1/16 inch, and there shall be one or more continuous lines of contact between doors and jamb. The hinges shall be of steel, semisteel, or malleable iron, securely attached to the door and door frame, reenforcing plates being used where necessary. Centers of hinges are to be placed not more than 9 inches from top and bottom edges of doors.

Locking Bolts: All single doors, or swinging doors of those in pairs, shall have not less than three locking bolts, at least one of which must be a horizontal

(Footnote continued on next page)

In the business with either extremely valuable records or with unusually large sums of money to be carried overnight, the highest class of safe built for its purpose is obviously the one to have. Such a safe is likely to cost more, of course, than a safe which is built to withstand less severe necessities. But to the man who needs it, it is indeed the most economical and, therefore, the type of safe to buy.

The doors of the safe present a difficult problem into which the elements of both fire and theft protection enter. This problem has been met by the manufacturers who build the door on the principle that the strength of the chain is its weakest link and that in safes usually the weakest link is the door. Provisions to overcome both the insulation weaknesses of the bolt mechanism and the inevitable crack between the door and the jamb are also of real importance. The problem of the lock is usually solved in connection with the problem of the doors. In nearly all cases the keyless combination lock is used.

A factor of importance is the filing equipment of the safe.

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zontal bolt engaging openings in the opposing door or jamb framing. The standing door of those in pairs shall have not less than two vertical bolts near the door opening, one at the top and one at the bottom.

Locks: The bolt-work system shall be checked by one combination lock, having not less than three changeable tumblers in addition to the driving wheel. The lock spindle must be so constructed that it cannot be driven in or withdrawn, or the lock must be such that the driving in or withdrawing of the spindle would not affect the position of the tumblers.

CONDUCT OF TESTS:

General Service Properties: Examinations and tests will be made to determine the properties of the safes in ability to withstand shipping and handling, ease of installation, and operation of doors, bolts, and lock, under condition of uniform support, of support at two or three corners only, and of moderate pressures exerted at points on the door or frame.

Fire Tests: The time-temperature curve followed, excepting in the explosion hazard test, shall conform to that defined in Standard C-19 of the American Society for Testing Materials. The flames and hot gases shall bathe the sample on not less than five sides without undue impingements, the door side to be always fully exposed.

Fire Endurance: The sample used in this test shall be of medium size, and lightly loaded with loose papers and records. It is placed in the furnace on incombustible foundations with suitable equipment for measuring temperature on the inside, installed so as not to affect the insulating efficiency of

(Footnote continued on next page)

It is evident that material kept in a safe must be accessible if it is to be of working value. Therefore, the more efficient the manner of keeping the records in a safe the greater the working value the records attain. For this and other reasons the interior of the safe should be given serious consideration. Filing equipment which may be arranged to fit the users' need is of great value. The illustrations in Figure 287 show two means of arranging filing equipment. The arrangement may be varied to fit practically every need.

VAULT PROTECTION¹

One place where fire protection is often needed, though seldom realized by the business man, is in large vaults. The safe-keeping of records in vaults from the burglar protection point of view is a matter of equal importance. The vital

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the safe. Temperatures shall be measured at several representative points within the safe, including not less than two points within 6 inches from the top, 1 inch from the sides opposite joints between door and jamb or between doors, on front line of equipment but not farther from the inside door plate than 2 inches. After exposure to the standard fire test for the duration specified under the pertaining type, the sample shall be allowed to cool in the furnace, with furnace doors closed, the inside safe temperatures being measured until the maximum is reached.

Impact Resistances: The sample used in these tests shall be the largest size on which proposal is made, loaded with a content of papers and records of 30 pounds per cubic foot or safe capacity, supported on shelves. The sample shall be subjected to the standard fire test for one hour, after which it shall be dropped base downward while in the highly heated condition upon a rip-rap of broken bricks. After cooling to normal temperature it is replaced in the furnace bottom upward and subjected to the standard fire test for one hour. All types of safes and cabinets are to withstand the fire, impact, and reheat tests, above specified, without destroying the legibility or usability of the records stored on the inside.

Explosion Hazards: A safe of medium or small size is subjected by any means to a very quick hot fire for about one-half hour, the intensity of which is considerably higher than that incident with the standard fire test of corresponding duration. The results of this test shall be considered in connection with the design of the safe, the character of the insulating materials and the record of service, in determining whether the given type of safe can be considered reasonably free from disruption and forcible opening of doors due to explosion of gases generated within it when exposed to fire.

¹See pages 628 for footnote 1.

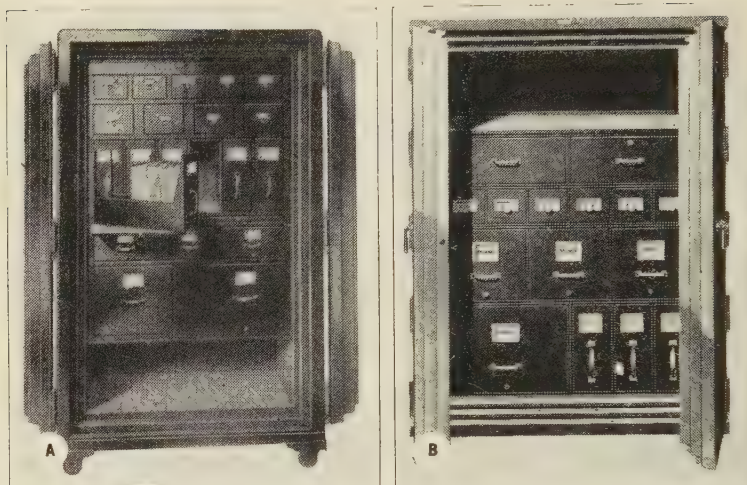


Figure 287: These illustrations show two means of equipping safe interiors. The more efficient the manner of keeping records in a safe, the greater the working value the records attain. It is interesting to note that it is possible to obtain filing equipment for practically any business need. See page 627.

factor in this problem is the strength of the material, or in other words, the amount of tonnage in the vault. Steel-lined, reenforced concrete vaults afford both fire and theft protection. The thickness of the steel lining varies, of course, according to makes; one and a half inches, however, is generally considered the minimum thickness for burglar-proof protection.

The thickness of the concrete walls varies in perhaps even greater proportion than the steel linings. The banks in the smaller cities are building concrete walls from 12 to 24 inches thick and are using in conjunction vault doors of heavy construction. The walls are generally reenforced by three-quarter-inch iron or steel rods spaced about six inches on centers and running both vertically and horizontally. As previously stated, practically 75% of these vaults are lined

¹Manufactured by such companies as Diebold Safe & Lock Company; Herring-Hall-Marvin Company; Mosler Safe Company; York Safe and Lock Company; and Remington & Sherman Company.

on the inside with steel plates at least one-half inch in thickness, thus affording additional protection and at the same time generally reducing the insurance rate. Both rectangular and circular doors are used—each affording the same amount of protection. Figure 288 shows the circular type. Note the thickness of the door. Most of the doors are constructed of three kinds of metal: open-hearth steel, five-ply chrome steel, and burn-resisting metal. When over 10



Figure 288: Vault doors are built in rectangular or circular styles. Here a circular door is shown. Note the thickness of the door, the size of the hinges, and the inner door. Although the same general principle of construction is followed in small cities as in large, the thickness of the doors and vault walls varies.

inches in thickness, quite frequently the doors have an insulation compound in addition to the above material. Especially in the case of heavy or thick doors is this true.

In large city banks the same general practice is followed,



Figure 289: By placing steel filing cabinets within vaults or safes a still higher degree of record protection is obtained. Wood cabinets are also recommended for safe interiors due to their non-conductivity. The arrangement of material within the vault is a matter of no little importance. Equipping the vault with burglar-resistant safety-deposit boxes, steel cabinets, and steel shelving offers a means of efficiently handling all types of valuable material. The vault doors shown here are of the modern insulated type.

but usually on a larger scale. Sometimes the concrete walls are made 30 inches, or 36 inches thick; they are always reinforced and lined with steel. The doors are generally from 12 to 24 inches thick, with cases now and then where even thicker doors are used. Large and heavily constructed vaults are usually equipped with emergency doors. As a rule, these emergency doors are of the same thickness as the main door, but are not so large. Often they are made just large enough so that the opening will permit a man to crawl through, if the occasion demands it, and open up the main door from the inside.

Book vaults and storage vaults are often constructed of concrete, but quite frequently of brick and tile. It is highly important that doors adequately resistive to fire be used, even where there is no necessity for burglary protection. It is also essential that the doors be properly installed.

Both walls and doors should be such as to exclude fire and water hazards. False security is often placed in vaults

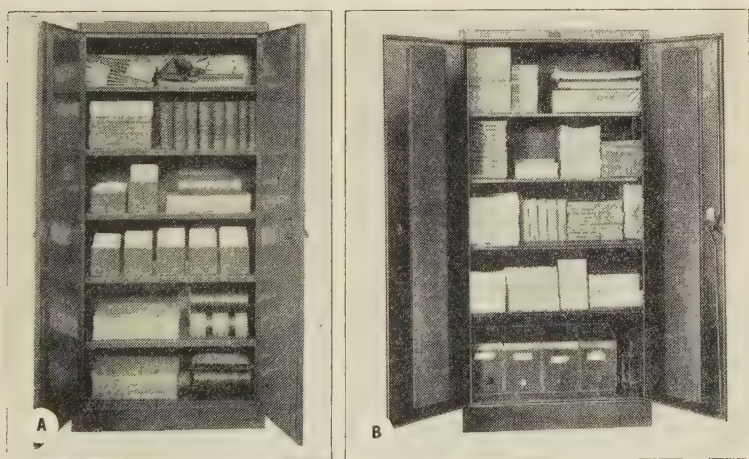


Figure 290: Steel cabinets offer a valuable means of housing papers of minor importance and of storing office supplies. There are many other uses for the steel cabinet, depending largely upon the needs of the individual organization. The ease of adapting the interiors to the various needs is a feature of great advantage.

which are of too light construction or with the door frame insecurely installed, or with inferior doors. A vault should be what the name implies. It is worth giving plenty of thought and time to the planning and erection of such structures.

Fire tests of vault doors reveal the great increase in fire resistance which has been made recently. The old-style vault door which had a resistance to a standard fire test of only about one half-hour has given way to the filled doors with pressed steel jambs which resist a standard fire test for four hours.

In the case of vaults the fire hazards exist not only on the outside of the vault, but also within. The Census Bureau in Washington lost some priceless records in a fire of this sort. A good many trust companies, banks, and large institutions are now providing protection within their vaults.

Equipping vaults with fire-resistant safes, burglar-resistant safety boxes, steel cabinets, and steel shelving, offers a very high degree of protection. Figure 289 shows how the steel filing cabinets may be placed within the vault. The interior arrangement of vaults is a point of no small consideration. A carefully worked out plan of housing records and other valuables in the vault is of great value. Especially is this true in the case of large vaults where a very careful check must be kept on all valuables stored.

STORAGE AND SUPPLY CABINETS¹

For housing papers of minor importance and for storing supplies, the steel cabinet is convenient (see Figure 290).

¹Cabinets are manufactured by such companies as All-Steel-Equip Company; Art Metal Construction Company; Berger Manufacturing Company; The Canton Art Metal Company; Cary Safe Company; Diebold Safe and Lock Company; The General Fireproofing Company; The Globe-Wernicke Company; The Hart & Hutchinson Company; Lyon Metallic Manufacturing Company; Manufacturing Equipment and Engineering Company; Metal Office Furniture Company; The National Safe and Lock Company; Rand Kardex Bureau; The Schwab Safe Company; Shaw-Walker Company; Steel Equipment Corporation; Stiffel-Freeman Safe Company; Terrell's Equipment Company; Victor Safe and Lock Company; and Yawman and Erbe Manufacturing Company.

When the storage and supply cabinet is used with safes and vaults the combination gives a high degree of protection to all records in varying degrees of importance. Such equipment offers little opportunity for weak spots in protection which are so disastrous to business. In modern fire-resistant buildings where fire hazards are not great, the steel cabinets handle papers in such a manner that they minimize the probability of fire. Practically all cabinets are of light-weight construction so that they may be moved from one place to another with comparative ease; the interior is spacious and allows for filing of papers as well as storage of other materials and supplies; and a combination or keylock provides safety under ordinary circumstances. There are a few companies, however, which make cabinets in heavy angle irons and heavy body mantle, as well as heavy casters to give strength to resist the impact of falling floors or walls.

One of the salient features of the storage cabinet—as is true of most types of safes—is the ease with which the interiors may be adapted to the storage of all kinds of material without fitting or drilling. In many types of cabinets the interior may be changed to fit any need, with special shelf adjustments.

The steel cabinet has a wide and varied use. Some organizations use the steel cabinet chiefly for filing records, others for storing office supplies. There are a great number of other uses for steel cabinets, depending largely upon the needs of the particular organizations.

SAFETY-DEPOSIT BOXES¹

Since history began there have been vandals and marau-

¹Safety-deposit boxes are manufactured by such companies as Marshall Equipment Company; Cary Safe Company; Diebold Safe and Lock Company; The General Fireproofing Company; The Hall's Safe Company; Herring-Hall Marvin Safe Company; Invincible Metal Furniture Company; Keyless Lock Company; Mosler Safe Company; The National Safe and Lock Company; The Reliable Safe and Lock Company; Remington and Sherman Company; The Schawb Safe Company; Steel Equipment Corporation; Stiffel-Freeman Safe Company; and York Safe and Lock Company.

ders—powers preying upon honestly acquired property. Ordinary locks proved vulnerable to the burglar, but the safety-deposit box with its specially built locks possesses the strength to resist the tools of the burglar. In order to obtain a greater degree of protection the safety-deposit boxes are placed within vaults. In banks and other institutions where a large number of safety-deposit boxes are used, vault installations are built specially to meet exact requirements. Figure 291 shows a safe-deposit vault installation. Also note the safety chests which are shown in Figure 292.

All manufacturers furnish deposit boxes in uniform sections of various sizes, constructed to intermember with one another. Sections are fitted with tumbler locks, guard-keyed, and supplied with any type of lock desired. The guard key must be inserted in the nose of the lock, before the customer's key can open the door. In addition to the standard type of lock an alternative plan of locking to meet the requirements can be supplied.

Many styles of safety-deposit boxes are made which em-



Figure 291: Safety-deposit boxes built within vaults offer a protection which possesses the strength to resist the tools of the burglar. In banks and other institutions where a large number of safety-deposit boxes are used, vault installations are built in sections as shown above.

ploy the method of unlimited expansion. The equipment is built up of units of any size from the smaller to the larger and so intermembered that facility is provided for further expansion, without discarding the first section. In adding each unit, a variety in sizes of individual boxes is given without disturbing the interchangeable unit feature.

THE VALUE OF PROTECTING RECORDS

Until recently it was not possible to obtain such a wide variety of containers for the protection of all classes of records. But today it would be rare to find a requirement for record protection in any business which could not be supplied by efficient containers affording predetermined values of heat resistance. For example, there are insulated vertical letter files which afford a certain degree of protection, there are safes with doors which automatically close and lock themselves when fire is imminent; and many other scientific developments of the safe—all of which build up a greater record protection.

Almost without exception, large business organizations use safes or vaults in fair quantities. Yet a very large share of concerns have serious potential leaks in their stockade of record protection. It is extremely easy to overlook the necessity of safeguarding one or two sets of records—and never to think of it until a fire destroys them, thus bringing their value to unavoidable notice.

Of the smaller businesses, where one or two or five men carry the whole burden of management, a comparatively large proportion are not equipped adequately to safe-keep their valuable records. Many lack safes altogether, or depend on obsolete styles which provide nowhere near the protection offered by newer models at a very reasonable expense.

Every place of business—store, factory, office, barber shop, restaurant, garage, professional man's office, church, school, governmental body—has valuable papers, business

records, insurance policies, leases, abstracts, mortgages, notes, receipts, bills, accounts, money which it would not want to lose if it were visited by a fire. Many of them realize that they should have safes—and put aside the thought as a serious expense.

The cost of a good safe is a good deal lower than the aver-

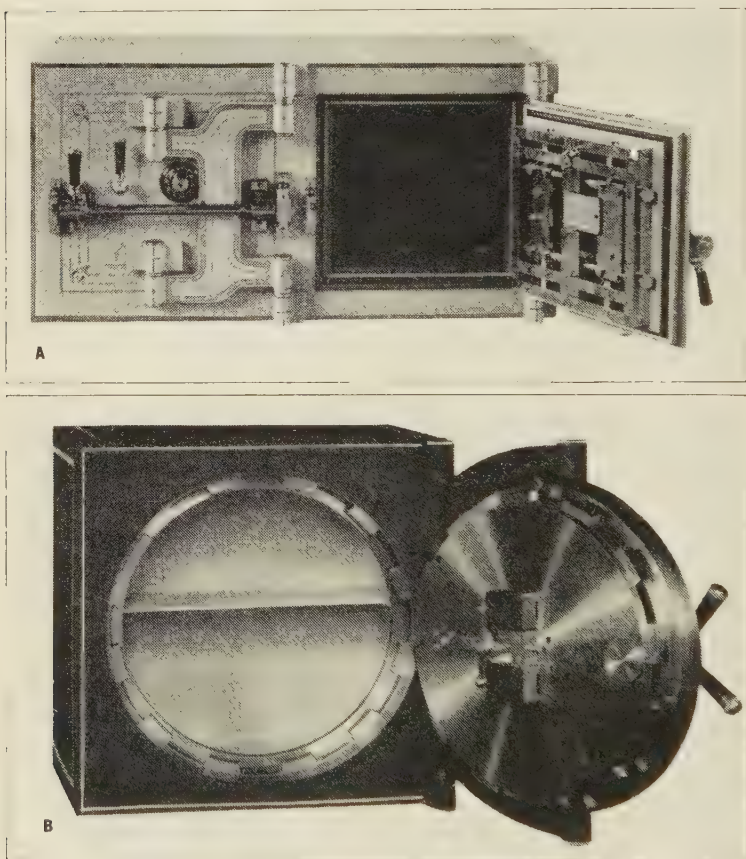


Figure 202: Where the greatest possible strength is needed, safety chests such as shown above are used. These chests may be placed in vaults or safes and are of special value to banks or other institutions which handle documents and merchandise of very great value.

age man would estimate who has never priced one. Even a safe designed and manufactured to withstand the most severe conditions is not beyond the means of practically any small business; and the costs are correspondingly lower for those firms so fortunately situated in respect to circumstances that a lesser degree of protection is adequate.

Mention has already been made of the saving in insurance which is possible to the business which keeps its valuables in safes. An interesting experience of this sort recently came up and graphically illustrates the possibilities of saving in some lines of business.

A furrier who had lost heavily on a robbery of his place of business purchased an installation of safes sufficient to store his entire stock of this merchandise. The savings both on his burglary insurance and on his fire insurance are very considerable. The upshot is that these savings in premiums are sufficient to pay the cost of the large installation inside a very few years.

Not infrequently a business man says, "I do not need a safe"—and believes it, in all sincerity. Yet, when he says it, he shows that he is not thinking of the records of his business which, for example, the fire insurance companies are entitled to examine in the event of a fire loss. Under these circumstances, the fire insurance companies are very much inclined to settle at a material reduction, or to take the case to court—for burning the records along with the stock is a standard trick of the fire-bugs, of which the companies are justly wary. When it comes to meeting the adjuster, the business man who has had a fire and has lost his records is pretty much at the mercy of the insurer. The only way that he can prove his loss is by his records—and when he cannot, the insurance adjuster is justifiably suspicious.

In a small business, the acquisition of a safe is frequently a token to creditors that the firm's credit limit may safely be extended. For one thing, it means that the customer can prove his loss in the event of a fire. In the second place, it indicates that he is of the careful type who looks out for

his own interests, and as well for his creditors' interests.

In the cities, a good many offices depend for their protection on the fact that they are in fire-resistant buildings. Yet this is no criterion of safety. The Burlington Building fire in Chicago was a fine example of the folly of relying on the building's resistance. The Burlington Building is almost as nearly fire-proof as a building can be constructed. But fire from the outside penetrated and cleaned out several floors. The building didn't burn, but its contents did.

When it comes to protection against burglary, no scrupulous safe manufacturer will assert that his safe cannot be robbed. As safes are improved, the yegg's technique is likely to keep step. But there are comparatively few criminals sufficiently skilful to break into a modern burglar-resistant safe. It keeps out all of the amateurs—and therefore is subject to insurance, with its contents, at rates which make such insurance an expense item of little importance. With the insurance, the business has more real protection against burglary of the contents of the safe.

Not the least of the advantages of a good safe is the peace of mind which it brings to its owner. A good many business men carry home their evening's receipts—and make themselves a particularly tempting subject for any hold-up man who chances to learn of their habit or to suspect it. Others, in small concerns, even carry home with them books of account, to prevent the loss of the records in a fire which might burn out the place of business. And here, again, there is grave danger of loss; for a serious fire, in the middle of the night, may well leave the business man only enough time to get himself and his family out of the burning residence.

It is well known, but perhaps not so widely realized as it should be, that a safe is intrinsically worth as much as the "valuables" stored in it. And as long as modern business depends for its history and guidance upon pieces of highly inflammable paper, just so long will there be a continuing and growing demand for the best devices that science can produce to safeguard these indispensable pieces of paper.

XXXIII

FILING METHODS

Mere safe-keeping does not make records valuable. There are five basic methods of filing: Alphabetic filing. Numerical filing. Geographical filing: by state; by city. Subject filing: alphabetic subject file; numerical subject file; decimal subject file. Chronological filing. Follow-up or tickler systems: correspondence size; the card follow-up. Transferring correspondence: duplicate equipment method; periodic transfer; maximum and minimum period transfer; perpetual transfer. Card records: the card ledger; sales records; stock records; credit records. Planning a central filing system.

ALMOST everything but records can be replaced. If a factory burns down, another building can be erected and equipped. Even if an important employee leaves the firm, he can be replaced. But lost records can never be replaced, for who can remember with accuracy thousands, or even hundreds, of financial papers and individual records of information? Obviously it is imperative that every business keep records of its transactions in a safe place.

But the mere safe-keeping of records is not sufficient to make them of value. In order to be actively useful, they must be quickly available; they must be classified in such a form as to be a dependable help to the various branches of the business. Take, for instance, carbon copies of letters, bills, contracts, and other such documents; they will be useless unless they are analyzed and arranged in some way convenient for quick finding.

The progressive business man realizes that files—hitherto mere depositories for records—hold potential profits. He has found that properly selected, maintained, and installed record-keeping systems protect the many elements of business, preventing costly friction between individuals and departments, and effecting far-reaching economies in time and money.

Profit comes to business in just two ways. One way is through increase of sales volume. The other is through savings effected in overhead. If you would cut costs, reduce overhead, handle more business with fewer clerks and bring your office nearer 100% in efficiency, you must investigate the tools with which your clerks are working. Antiquated methods of filing are expensive because they waste time; they have no place in the modern office.

Filing may be defined as the act of placing in systematic arrangement papers, correspondence, pamphlets, and books in such a manner that they can be produced promptly when called for.

It is comparatively simple to put such matter away, but finding is difficult if the filing is not accurately planned and executed. The final test of any filing system is the ease with which the material can be found.

Filing and indexing are no longer guesswork; they have passed from the experimental into the standardized stage. Standardized systems and equipment can easily be obtained, together with trained file clerks that are ready to file completely and efficiently, to index and make available all the needed records—varied as they are in kind, size, quantity, and use. Finding and filing have become the hub of efficient office work, and the spokes radiate out through all the departments to the outer rim of the aim and scope of the business.

It hasn't been so long since the business man handled all his correspondence himself, from the opening of letters to their filing; and the man who had a sufficient amount of correspondence to require the services of an amanuensis was the exception rather than the rule. The number of papers handled was so limited that the filing question was more or less negligible, the usual practice being to jab the paper on a stick or spindle file, or to store it away in a drawer or cupboard.

Since then the growth of the country and new inventions have made it possible to transact business in hours, and even

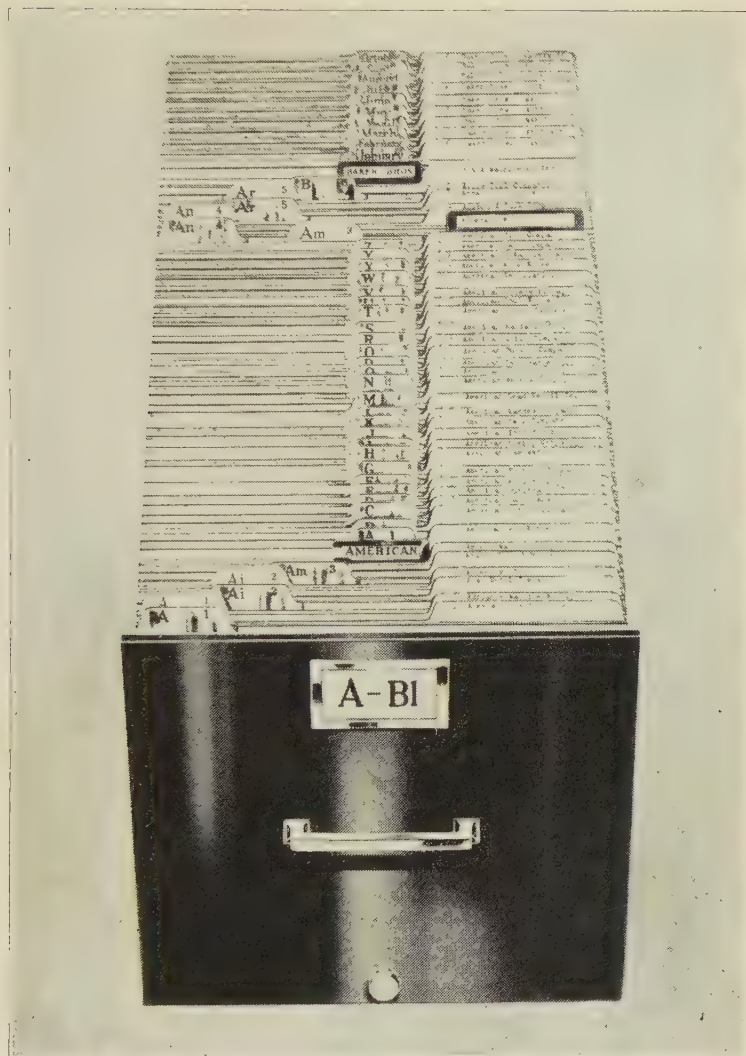


Figure 293: Alphabetic arrangement by names of firms and individuals is the most common and satisfactory method of filing correspondence, telegrams, memos, and similar records. Note that alphabetically indexed guides confine the search for a particular folder to the place where it belongs.

A detailed explanation of this system is found on page 646.

in minutes, where formerly days, weeks, and, sometimes, months were required. To meet the demand for a better filing equipment, which naturally arose with the increased volumes of papers, the first systematic devices were developed. In the first installations the papers were filed behind guides without folders. The use of folders, which produced a much more satisfactory file, was developed somewhat later. The first systems were almost entirely numerical. It was the demand from the Chicago jobbing houses for alphabetic and geographical systems which resulted in the manufacture of the first alphabetic subdivisions.

The position of papers in filing may be vertical or flat. The latter method is used only when there are so few papers to be handled that they can be placed on top of each other in a drawer, or when the papers are too large to stand on end. Vertical filing is used almost exclusively today, because it has been found that papers and cards can be easily put away, quickly found, and kept compact and clean by this method.

The whole scheme of record-keeping involves three great classifications: the system, the cabinets, the supplies. In this chapter a brief description of the methods of filing—first “paper filing,” then card records—will be given. Cabinets and supplies will be considered in the next chapter.

THE FIVE BASIC METHODS OF FILING¹

Every file, irrespective of the system used, must perform two functions:

1. Properly store and preserve papers and records.
2. Produce papers and records instantly when desired.

¹For detailed information on these methods, get in touch with such companies as: Amberg File and Index Company; The Automatic File and Index Company; Baker-Vawter Company; The Globe-Wernicke Company; The Macey Company; Rand Kardex Bureau; Shaw-Walker Company; The Wabash Cabinet Company; Wagemaker Company; The Weis Manufacturing Company; Yawman and Erbe Manufacturing Company.

ject indexing systems, the same basic principles have been applied by all. Each has simply injected his own individuality into his particular system.

No attempt can be made here, obviously, to illustrate and describe each individualized system. Instead, a general

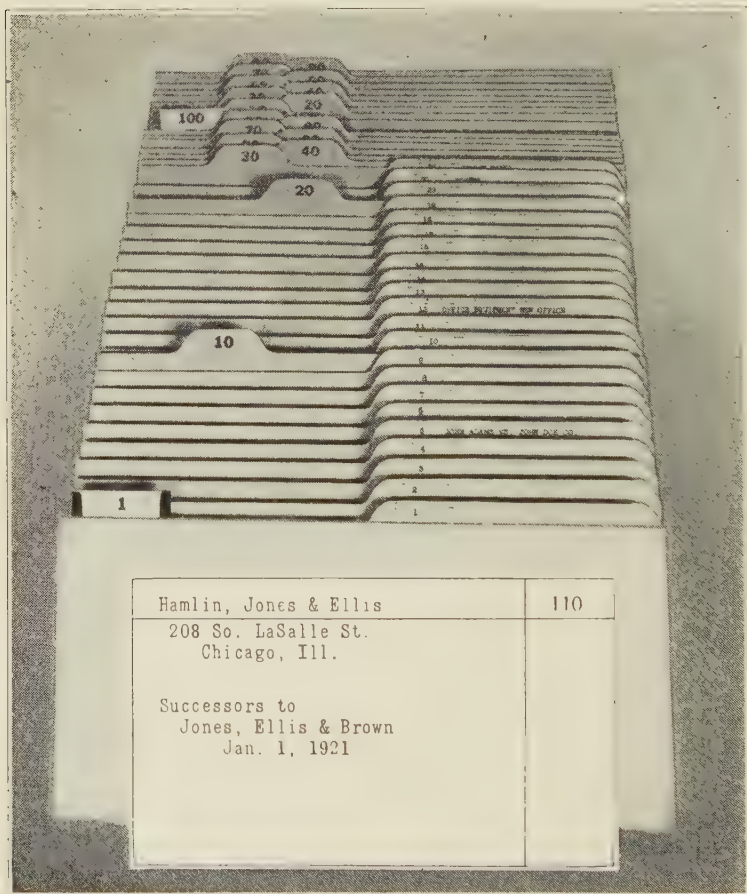
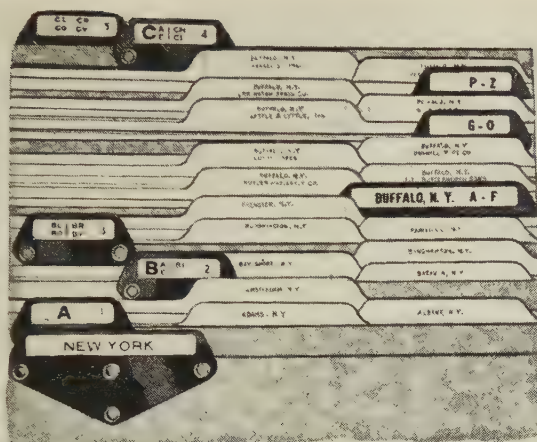
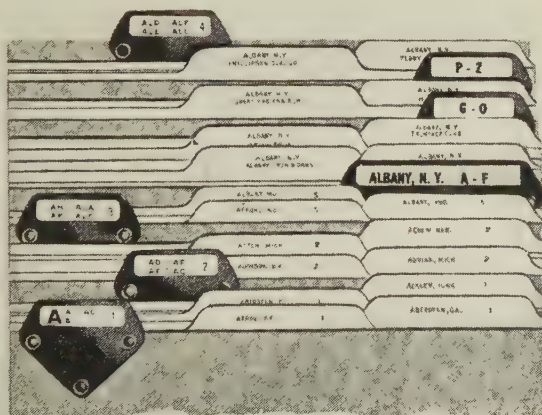


Figure 295: With a numerical system, each correspondent or subject is assigned a number and a cross-reference card such as the one shown. The cards are filed alphabetically. This system is especially desirable for the filing of some types of contracts, legal and other technical papers that are difficult to arrange alphabetically. See page 649.



A



B

Figure 296: In businesses basing their work on territorial divisions, geographical files are often used. The arrangement may be either (as in illustration A) alphabetically by states, subdivided alphabetically by towns; or alphabetically by towns, subdivided alphabetically by states, as in B.

Pages 651 and 652 tell how filing is done by this method.

descriptions of the five methods will be given. Adaptations of these systems will often be found necessary to fit individual requirements. Most manufacturers of filing systems have special departments which draw up plans for unusual or new systems where such are necessary.

ALPHABETIC FILING

The popularity of this method is due to the fact that with it papers are found by direct reference. This eliminates loss of time spent otherwise in referring to a separate index to determine the exact location of the wanted record. It is best adapted to such matters as correspondence, invoices, purchase orders, and similar records common to all offices.

A vast amount of experiment and labor was necessary for the perfection of this system, simple as it may appear. It seems plausible, at first thought, to make 26 divisions in an alphabetical file—one for each letter of the alphabet. But, because some letters are used more than others, such divisions would be very uneven. For instance, A would be a very bulky division, and Z a small one. By examining lists of names, experts figured out how many times certain combinations of letters appeared in names, and divisions and subdivisions of the alphabetical combinations have been based upon this investigation. For instance, under A there might be—depending, of course, on the needs of the organization—divisions for Ai, Am, American, Ar, and so forth.

Each properly designed alphabetic file (as for letters) is divided into two main parts: guides and folders. The guides are sheets which stand upright in the drawer, indexed on the top margin, each representing a portion of the alphabet. Figures 239 and 294 show alphabetic files. By this arrangement of alphabetically indexed guides convenient distribution is secured, confining search for any correspondence to the particular place where it belongs. Notice in Figure 293 that auxiliary special name guides are used, to-

gether with auxiliary alphabetic guides and auxiliary monthly guides.

Folders are of two kinds: individual and miscellaneous. A regular correspondent is one with whom there is regular or frequent correspondence; his communications are filed in a folder bearing his name.

Miscellaneous correspondence consists of letters which arrive from various occasional sources; such correspondence is arranged alphabetically in miscellaneous folders. When the file clerk finds it necessary to refer to the miscellaneous

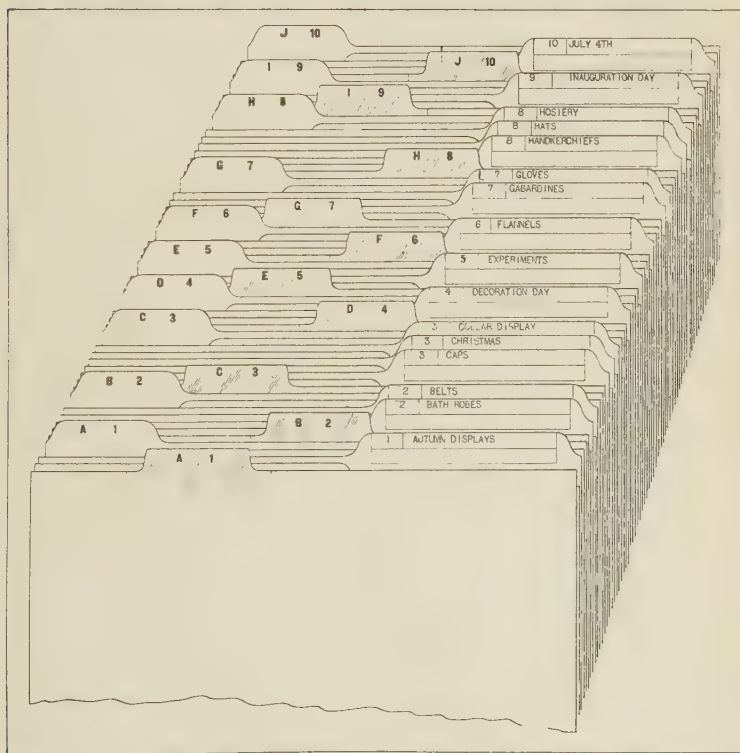


Figure 297: To be able to locate all matter pertaining to a certain subject together in a single folder is convenient. The best arrangement of a subject file is the alphabetic, shown above.

folder, she should determine whether there is already a piece of correspondence with that person or company in the miscellaneous folder. If there is, she should not insert the second piece but make a folder for that name.

Consecutive numbers on the primary guides help the clerk to see that the guides are in their right sequence when *first* placed in the file. These numbers are sometimes used, especially in a large file, in coding or numbering the correspondence to be filed and refiled. Coding is for two purposes only—speed in filing and a check against misfiling. For instance, Am might be 3, and therefore the folders for the Amazon Tire and Rubber Company would be marked 3. In other words, the number on the individual and miscellaneous folder is the same as that on the primary guide which marks the division of the alphabet.

The file clerk has the chart of the alphabetical combinations with the numbers in front of her so that the coding is done with great rapidity. She selects the number of the nearest alphabetic combination to the name to be filed. If the name falls between two alphabetic combinations, she automatically takes the number above. The reader should not take it from the foregoing that coding of all correspondence before filing is recommended. Rather, the above information is intended merely as a guide as to the proper way of handling folders when first making them out.

In filing by this system, the proper alphabetic guide must first be found. If, for example, a letter from Bernard and Company is to be filed, the first process is to refer to the alphabetic guide (probably Ber), then to the individual folders alphabetically arranged by title, name, or subject. If no individual folder has been assigned, the corresponding miscellaneous folder is next located and Bernard and Company's letter filed alphabetically or chronologically within. As soon as a sufficient number of papers and letters are accumulated around any one name, an individual folder should be made. A good rule to follow here is to make out an individual folder when a maximum of three pieces of cor-

respondence has been accumulated. This keeps the miscellaneous folder reduced to its minimum, making it convenient for filing and referring. No folder should be allowed to become too bulky for convenient handling. In fact, the maximum capacity of a folder is approximately 50 sheets, and where the correspondence is very heavy it may be divided by months, subject, or location when an individual folder reaches the maximum capacity point.

The reference from one name or subject to another name or subject is made on a sheet of paper of distinct color and filed in the folders with the regular or miscellaneous correspondence, as the case requires. Such a cross-reference might read:

Rice, Hoadley and Brown
name changed to
Hoadley, Brown and James

Obviously, no card indexes are necessary in the operation of an alphabetic file.

NUMERICAL FILING

Sometimes records are kept in numerical order instead of alphabetic, each record or group of records being given a number. This method requires an alphabetic index or cross-reference to determine what the numbers represent.

The system lends itself to the filing of business records, invoices, orders, and such records as need to be cross-referenced or controlled from one source. It has, also, special institutional and professional uses such as for hospitals, doctors, and dentists, where a reference number is assigned to each case. A frequent use of the system is in cases where correspondence is filed according to the number of some document or record. For instance, many insurance companies file all matter relating to a certain risk according to policy number. There are also many specialized commercial uses, such as the filing of way-bills in railroad offices.

The numerical way is especially popular when it is desired to cross-index the records, so that related records and groups of records may be filed together under the same number. For instance, supposing you were corresponding with the firm of Smith and Jones and were receiving letters signed by both Smith and Jones; if you gave both Smith and Jones the same number in the file, their letters would eventually be filed together under that one number. Some firms still continue to use this system for filing correspondence.

Note in Figure 295 that the guides are marked with divisions of tens—10, 20, 30, and so forth—to aid in rapid filing. There is a folder for every correspondent.

When correspondence is numerically filed, each regular

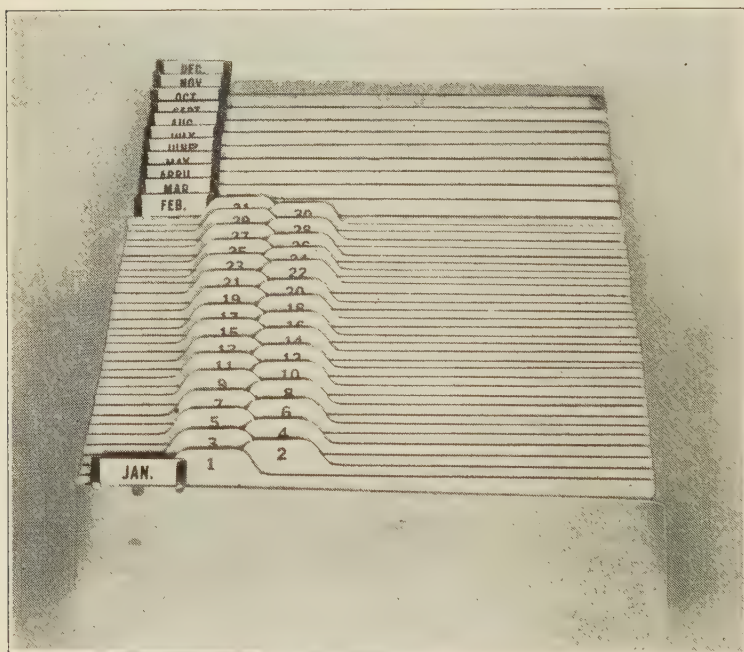


Figure 298: To keep business matters needing further attention from being overlooked, a follow-up file is maintained. When an executive wishes to follow up an answer to a letter, a carbon copy is placed in the follow-up file—in the folder for the date named. See page 659.

correspondent is given a number. The numbers are assigned consecutively beginning with one, and the system permits indefinite expansion. A card made out for each correspondent bears his name, address, and file number. The cards are filed alphabetically in the card index.

In some organizations, the number assigned by the file clerk is sent to all departments keeping records of a given correspondent, so that all records in the house, such as orders, invoices and ledgers for this correspondent, bear the same number.

When the mail comes to the filing department, the clerk underlines the name under which the letters are to be filed, then sorts them and looks up the number in the card index, and places that number on the letter. If the correspondent is new, the next unassigned number is given to him, a folder made out, and a card bearing the same number made for the card index.

Miscellaneous correspondence may be cared for in separate alphabetic miscellaneous folders according to the names of the correspondents, or the letters may be classified and each subject assigned a number in exactly the same fashion as numbers are assigned to names. Usually the miscellaneous letters may be grouped into a dozen or so divisions.

GEOGRAPHICAL FILING

Where exact territorial divisions are of prime importance, geographical filing provides a means of grouping correspondence from each city, state, or county by itself. It is particularly advantageous for certain types of sales work, such as mail-order selling, where all correspondence from certain territories must be kept together for ready reference. Aside from the purely filing functions, a geographical file also serves as an indicator of the sales activity of a different section and as a mailing list for circularizing, and so forth.

Geographical filing systems, as sold by the several manu-

facturers, vary, but all are based on the same principle; they differ mainly in the position of the guides.

Material is filed geographically either (1) by state and city or (2) by city.

Geographical Filing by State. Under this plan the guides are arranged (1) alphabetically by city and (2) alphabetically by name of correspondent. Reference to illustration A of Figure 296 will aid the reader in understanding this method. He will see that such a file consists of state, city, and auxiliary guides, folders for regular correspondents, and folders for miscellaneous state and city letters. The individual folders are marked with the state, city, surname, given name, or initials of the correspondent.

The following serves as an example of this arrangement of a geographical file:

Iowa, Albion, Wilson S. R.
Iowa, Burlington, Cannon, P. L.
Iowa, Keokuk, Small, Robert

If there is little miscellaneous correspondence, a miscellaneous folder is introduced for each state; but when the volume of such letters warrants it, there is such a folder for each city needing one.

Colored sheets placed as in the alphabetical system serve for cross-reference purposes.

Geographical Filing by City. Many firms use this method when the city, rather than the state, is the important thing. The file is arranged (1) alphabetically by city, (2) alphabetically by state under each city, and (3) alphabetically by name under each state.

To illustrate, letters would be filed thus:

Portland, Maine, Field, James
Portland, Maine, Jones, Roger
Portland, Maine, O'Brien, J. J.

Illustration B of Figure 296 shows the alphabetical arrangement by city, state, and name.

To meet special conditions, variations of the geographical system have been devised. In some instances it is necessary to arrange the file (1) by groups of states, (2) by city, and (3) by name.

Some organizations must have data available by counties, and in such instances the file is arranged (1) alphabetically by state, (2) alphabetically by county, and (3) alphabetically by name.

Other companies do business in but one state and therefore have no need for the state divisions.

SUBJECT FILING

This method is adapted to the filing of such material as data, information, clippings, catalogs, and so forth, pertaining to one general subject, such as, "Insurance," "Building Construction," "Repairs."

Subject files may be arranged in three ways:

1. Alphabetically by words or terms defining the subject.
2. Numerically by assigning a number to each subject as it develops.
3. By a decimal system, that is, grouping the main subjects with subdivisions to which a decimal notation is fitted for convenience in sorting, filing, and handling papers.

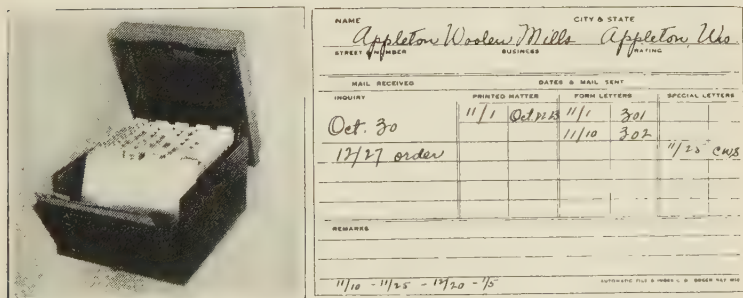


Figure 299: Another kind of follow-up file is the card-index system. A small desk file is pictured here. After suitable entries have been made and the next follow-up date determined, the cards are filed behind the proper daily guides. Follow-up methods are discussed on pages 659 to 661.

Alphabetic Subject File. The simplest of these is the alphabetic file. This system consists of the alphabetic arrangement of subject-matter back of main and sub-heading guides placed in alphabetic order. Individual folders bearing subject titles are arranged alphabetically behind their proper subject guide. Folders containing the subdivisions of each subject carry this caption, together with the main subject heading, to enable accurate and rapid refiling of the folders removed for reference, and these sub-subject folders are also arranged alphabetically for any subject.

This system not only provides for unlimited expansion or elimination without any modification in the general arrangement scheme, but it entirely eliminates any reference to indexes or other "indirections." To operate it, all one need know is the desired subject, and then it is just as simple as finding a word in the dictionary.

Example:

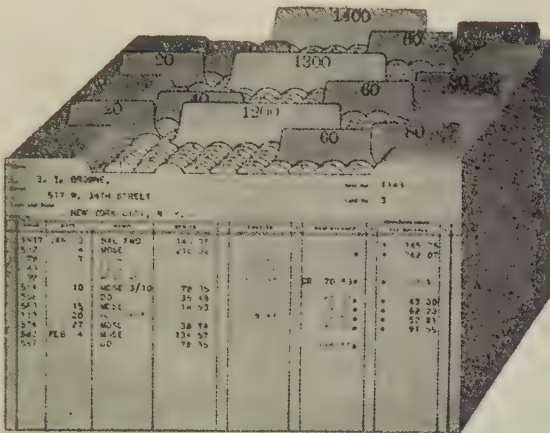
A	.....	guide
	Advertising	 folder
	Americanization	 folder
A	.....	miscellaneous folder
An	.....	guide
	Argentina	 folder
	Automobile	 folder
An	.....	miscellaneous folder

In some systems the guides are marked thus:

Aa—Am	.....	guide
	Advertising	 folder
	Americanization	 folder
Aa—Am	.....	miscellaneous folder
An—Az	.....	guide
	Argentina	 folder
	Automobile	 folder
An—Az	.....	miscellaneous folder

An alphabetic card index of the subjects used and of all cross-references must be carefully kept.

Figure 297 shows a typical subject file used by the chief



A



B

Figure 300: Certain kinds of records may be kept on cards when it is so desired. Illustration A shows ledger cards filed numerically by account number. When this method is used, a number is assigned to each new account as it is added. Illustration B of this figure represents an alphabetic card ledger file. Cards may also be arranged by towns or salesmen's territories, as described on page 666.

window dresser of a large department store for filing window-display suggestions. In this file each folder bears a type-written designation. In the folder "Decoration Day" will be found suggestions, clippings, photos, notes, and so forth, for all displays suitable for use on the occasion of that holiday. Miscellaneous folders are provided for filing data not sufficiently voluminous to warrant the use of individual subject folders.

Numerical Subject File. In some lines of business the many subjects cannot be described in alphabetic terms nor grouped into main subjects with subdivisions, but they may be grouped together under numbers to good advantage, with the few subdivisions which may chance to occur.

An alphabetic card index to subjects and cross-references is necessary. Letters within a folder are arranged alphabetically by names of the writers and each must bear the number of that subject.

Consecutive numbers are assigned to the principal subjects, taking care to make the headings as clear and comprehensive as possible. These subjects may then be divided into as many sub-subjects as seem necessary, by the use of a dash number. When a division of a department subject becomes advisable, a letter of the alphabet is added to the auxiliary number.

3.	.....	Office buildings
3—	.....	Masonry
3—1a.	.....	Face brick
3—1b.	.....	Common brick

The consecutive numbering makes this system simple to operate and gives it great elasticity, as new subjects may be added at any time by simply assigning the next unused number of a subject as it develops.

Decimal Subject File. This method is based on the Dewey Decimal Classification and Relative Index for Libraries, Clippings, and Notes. It is used by railroads, the Federal Government, and highly specialized organizations.

255	.....	Exchange accounts
255.1	.....	Subscribers' accounts
255.11	.....	Accounts in suspense
300	.....	Construction
400	.....	Equipment
500	.....	Operation
600	.....	Rates, and so forth.

CHRONOLOGICAL FILING

Chronological filing is used for the most part in connection with other basic methods. For instance, correspondence from one firm is placed in a folder chronologically. Where a folder becomes congested with letters the most natural thing to do is to subdivide the letters according to months. The equipment for this is merely a set of monthly folders—preferably of a distinctive color.

Chronological filing as a method in itself, however, is often used for daily reports, deposit tickets, freight bills, statements, order sheets, and so forth, that you want to keep together by dates. But its chief purpose is for follow-up information in a card index.

The equipment for letter files consists of monthly folders preferably of a distinctive color. The equipment for card indexes consists of monthly, weekly, or daily guides or a combination of these according to the needs.

OPERATION

Matter in a purely chronological file, obviously, is referred to by date. If it is necessary to refer to the matter in any other way—by name, for instance—a duplicate record is filed alphabetically.

There are a number of ways in which to operate a chronological card file but each one is so decidedly the solution of a specific problem that their descriptions would not be in place here. One use of chronological filing, however, is en-

larged upon in the discussion of "Follow-up or Tickler Systems" which follows.

The foregoing methods of filing do not, of course, cover all requirements. Adaptations will often be found necessary. The manufacturers of filing supplies maintain staffs of experts who draw up plans for systems to cover individual needs.

A treatment of filing methods is not complete without a mention of follow-up systems and of the transfer of correspondence. Therefore, a short space will be allotted to each of these subjects.

FOLLOW-UP OR TICKLER SYSTEMS¹

Matters which require action on a certain future date are continually coming up, and to bring them to the attention of the executive a follow-up system is necessary.

To illustrate the need of such a file: It may not be possible to answer a letter immediately upon its receipt; in that case it is filed away and brought to the executive's attention at such time as an answer can be sent. Again, if the executive writes a letter that requires an answer, he wants to be sure that he receives that answer, perhaps before some certain date. Therefore, a carbon of his letter is filed away and brought up again on a date designated by him.

A follow-up is strictly a date file; that is, by some arrangement of month and day guides or of alphabetic guides followed by date guides, certain matters are brought up automatically for attention. All follow-up systems require that all matters which should come up at some future time be marked with the follow-up date, and it seems best to pencil this in the lower right-hand corner, since this becomes, in filing position, the upper right-hand corner.

There are two kinds of follow-up files: the correspondence size and the card system.

¹See footnote on page 642.

Correspondence-Size Follow-Up System. The guides for this file (Figure 298) are the 12 months of the year, and as many sets of 31 guides for the days of the month as desired. The average follow-up system is planned for two or three months. When an executive wishes to follow up his answer to a certain letter, he has his stenographer make two carbons. One is attached to the incoming letter and the other, marked with the follow-up date, is placed in the folder for that date. The follow-up file is arranged so that the current date stands first in the file, and as the papers for that date are attended to, the guides are placed in the back of the file. The papers are sent to the executive late in the day previous to the date named. Such a system keeps the executive's mind free from the detail of follow-up from the time he indicates the date when he wants a paper until he receives it.

The Card System. This follow-up file is simply a brief reminder of any matter which is to come up at some future

ARTICLE		REMARKS		DATE		NO.	
1 # 20		Bin - 2		ONE		12	
14 - 208 Standard Dress		Card - 2		ONE		12	
CHAINED		REMARKS		DATE		NO.	
3/2 2112	1	3/2 2112	1	3/2 2112	1	3/2 2112	1
3/2 2120	12	3/2 2120	12	3/2 2120	12	3/2 2120	12
3/2 2112	12	3/2 2112	12	3/2 2112	12	3/2 2112	12

Figure 302: To avoid shortages as well as overstocking, a careful record must be kept. Cards such as the one shown here provide one way of assuring that such information is at hand. The exact form of the card is, of course, determined by the character of the stock and other conditions peculiar to the firm by which it is used. See page 667.

time. It is not necessarily confined entirely to the matter in the file, since it may refer to a telephone call or an appointment. Figure 299 shows such a file.

The cards are filed behind month and day guides in a desk tray or card file and those coming up on a given day may be attached to the papers which they call from the file and the whole story is thus sent to the executive interested. The matter should, of course, be charged in the usual way. When it has received attention, a new date, if necessary, can be indicated and all the material returned to the file to be treated as previously.

The advantages emphasized for the card tickler are:

1. All material in one place;
2. The whole story at hand when the matter is followed up;
3. Responsibility for follow-up placed under one control.

Variations of these two systems are used in some offices. It should be borne in mind that these are described merely to indicate in a general way how the follow-up problem may be handled.

TRANSFERRING¹

In most business offices correspondence is taken from the main current files at certain times of the year and placed in less expensive transfer cases or cabinets where it continues to be accessible to the needs of the particular office. This practice is known as "transferring."

It is necessary to transfer because files will hold only so much. It is a case of transferring to inexpensive transfer cases, or buying new filing cabinets. Therefore, transferring is an economy.

When current files are clogged and choked with an accumulation of old correspondence, they slow down letter finding and filing time and tend to make the file clerk

¹See footnote on page 642.

slow and inaccurate in her work. When you transfer, nothing remains in the files but the active correspondence which is constantly referred to. Think of the difference in speed and accuracy and actual saving of time and effort this makes in the filing department.

The correspondence which is transferred from the current files is still referred to occasionally. For this reason transferring should be done properly, so that last year's letters will be readily accessible in the space of a few seconds' time.

There is no fixed rule as to the time and frequency of transferring. The whole question hinges upon the volume of correspondence and upon the length of time a letter or other written record remains active in the current files.

In some offices correspondence is transferred once a month, in others twice a year, in still others once a year. Then there are offices in which the very bad practice of transferring spasmodically is carried out whenever the files become choked with papers. The result is usually slipshod filing methods.

Several different methods of transferring correspondence are followed. They are:

1. Duplicate equipment method
2. Periodic method
3. Maximum and minimum period method
4. Perpetual method

Duplicate Equipment Method. By duplicate equipment method of transfer is meant exactly what the name implies; duplicate current equipment is kept, the two outfits being used alternately. The length of the period of alternation depends on the nature of the business.

This method saves much handling of material in the files, and consequently saves time and money. The file clerks, instead of handling the last period's papers over constantly, as they would have to if the full two periods' records were kept in the same set of files under the same index, handle the very minimum of papers. And yet the papers of the last

NAME <i>James D. Abbott</i>		1--FINANCIALLY GOOD. PROMPT PAY.	
ADDRESS <i>2217 Grove St.</i>		2--PAYS ACCORDING TO AGREEMENT. REGARDLESS OF MEANS.	
TERMS <i>30 days</i>	DATE <i>6/26</i>	3--SLOW, BUT SAFE TO CREDIT.	
		4--RISKY RESPONSIBILITY DOUBTFUL.	
		5--DEMAND CASH.	
		1-2--PAYS BY NOTE.	
		1	2
		3	4
		5	
CREDIT ASKED \$ <i>200</i>	CREDIT LIMIT \$ <i>500</i>		
HOW EMPLOYED <i>Real Estate</i>			
BY WHOM EMPLOYED			
BANKS <i>First National - Farmers State</i>			
MARRIED ☒	SINGLE		
WIDOW			
REFERENCE <i>J. B. Stone Co.</i>			
	RATED <i>F 2</i>		
PROPERTY <i>home farm</i>	PHONE <i>Drake 2407</i>		
IF WOMAN, GIVE FULL NAME OF HUSBAND			

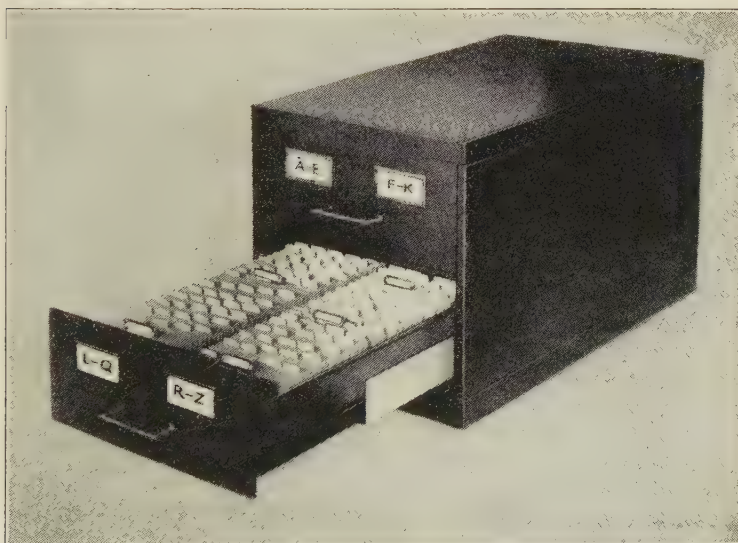


Figure 303: A card file giving a brief summary of information from which credit is passed is a valuable adjunct to the credit file and serves also as a department index to it. In the above illustration, a typical card record with container is shown. The card bears the name, address, and file number as well as the summarized credit information. For complete details, read page 668.

period are handy for reference, when necessary, in another set of files standing right beside the immediately current files.

Periodic Transfer. Under the periodic method of transfer, the entire contents of the current files, with the exception of guide cards, are periodically (say on every December 31) shifted to storage units and a new current file started. This can be done successfully only where there is very little reference to material in the files; otherwise it will be necessary to refer constantly to the transfer files at least for a period until the transferred material becomes more or less inactive.

Maximum and Minimum Period Transfer. Under the maximum and minimum period method of transfer, maximum and minimum periods are taken—say, 18 months and 6 months, respectively. The plan, then, is to retain at least 6, and no more than 18, months' material in the current files.

Eighteen and six months are cited merely as examples of the maximum and minimum periods, which may be any two fixed periods of time.

In actual practice this method works out about like this: Transferring is begun on the last day of the maximum period. On the first day, possibly "A," "B," and "C" material is transferred; on the second day, "D," "E," and "F" material, and so forth, until the job is done.

The chief advantage of this method is that transferring can be accomplished a little at a time, right along with the regular routine of the filing department. It is adaptable probably to more classes of business than any other method of transfer.

Perpetual Transfer. Under the perpetual method of transfer, obsolete, closed or dead matter is removed from the current files and placed in storage units at irregular intervals, at no set time—just whenever the contract, legal case, claim, or whatever it may have been, is closed.

This method requires the marking of matter when com-

pleted or obsolete, or the editing of the files, to determine what matter should be transferred. It is used primarily in cases where each subject, such as contracts or jobs, legal cases, claims, permanent data, or statistical files, is a complete unit.

CARD RECORDS¹

In the modern office a vast amount of information is kept on cards of standard size, either plain or ruled, filed either in vertical cabinets² or in visible index devices.³ Only the former will be considered here.

Card files are arranged either alphabetically, numerically, geographically, or by subject, dependent on the information they record. Guides like those used in correspondence files save time in finding and filing.

The several manufacturers have developed systems for almost every possible kind of record. Such systems are adaptable for sales records, stock records, follow-up, mailing lists, quotations received, quotations given, purchase records, expiration records for fire insurance agents, real estate "for sale" records and "for rent" records, rent ledger forms, signature and rental records for banks, safe deposit records, mortgage loans, ledger cards, hospital records, physicians' ledger and history cards, dentists' ledger and history cards, engineers', architects', and contractors' records, application and employees' records, pay-roll records, factory reports, students' grade records, credit and collection records, and so forth. It is, of course, impossible to describe all these systems. Only the most important—those which have a broad application for every business—will be treated here.

¹For details on card-index systems, write such companies as: Amberg File and Index Company; The Automatic File and Index Company; Baker-Vawter Company; The Globe-Wernicke Company; The Macey Company; Rand Kardex Bureau; Shaw-Walker Company; The Wabash Cabinet Company; Wagemaker Company; The Weis Manufacturing Company; Yawman & Erbe Manufacturing Company.

²For description of cabinets, read Chapter XXXIV, Filing Equipment.

³Read Chapter XXXV, Visible Index Systems.

The Card Ledger. Such a system may be used instead of a book or loose-leaf ledger, when conditions in the office of the user warrant it.

The cards (or leaves) are filed alphabetically, numerically, or geographically, depending on existing conditions. Illustration A of Figure 300 shows a numerical card ledger. By this method the cards are arranged by account number, a number being assigned to each account as it is added. In the geographical ledger, the cards are arranged by towns or salesmen's territories and then alphabetically by the names in each town. Illustration B of this figure presents an alphabetical card ledger file with the cards arranged as in a city directory, by name of the account.

Certain distinct methods of operation have resulted from the development of the card ledger. A clerk in the department takes the orders, invoices, cash books, or cash sheets and pulls from the ledger the corresponding cards on which the postings are to be made. After the cards have been posted, but before they are refiled in the tray, a proof of the work which has just been done may be taken. The card

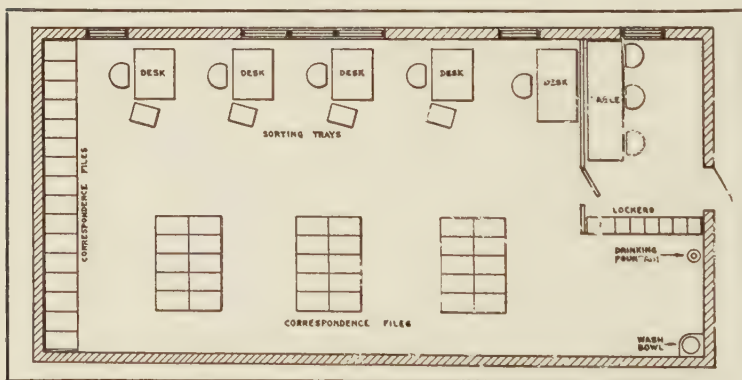


Figure 304: In order to obtain efficient service many businesses find it advisable to put as many records as possible into a central filing department located near those departments using it most frequently. An effort should be made to place the furniture so that all possible waste of time and energy be eliminated. See page 668.

ledger may be divided into any number of sections with a controlling account for each section. Cards so "pulled" can be kept separately as open accounts. Balanced accounts remain under closed accounts.

Sales Records. Sales records help to build up business. They are complete records of past, present, and prospective customers. At any time they will give the following facts: A classification of all customers by business; which customers have not bought recently; which prospects ought to be called on; the amount sold each customer by lines; what lines are selling best in each territory; the total business in each territory.

Figure 301 shows a sales record-card. There is a card for each prospect and the numbered tab indicates his business classification. When he becomes a customer, the "pros" tab is cut off. The reverse side of the card is used for recording sales statistics.

Stock Records. Stock records help to prevent shortages as well as overstocking. They are a necessary aid to the purchasing agent for intelligent buying. They substitute "I know" for "I guess." They show:

1. How and when each item of stock was received and delivered;
2. Quantity on hand at any time;
3. Where the stock is;
4. When to order;
5. How much to order;
6. Amount used during a given period;
7. The season of greatest demand;
8. Which lines are moving and which are not;
9. Current information regarding sales and manufacturing conditions;
10. How much capital is needed for immediate investment in goods.

A card is made out for each article, each size, color, style.

and so forth. New cards are added and old ones removed without disturbing the others. The record contains only active cards, and every one is instantly available. Items are posted rapidly. Minimum stocks are easily signaled.

The exact form of the card is determined by the character of stock, physical stock-room conditions, and particular requirements in the concern where it is to be used. The fundamental entries include the name of the article, date, and quantity received and delivered. Additional records may be kept as needed. Figure 302 shows a typical card.

Credit Records. Up-to-the-minute credit information about every customer enables the business to accept the maximum number of orders at minimum risk.

A card index to credit information is a most valuable adjunct to the credit file. The form shown in Figure 303 is typical.

The card bears the name and address, the file number, and a brief summary of information from which credit is passed, in many cases without reference to the file itself.

In addition to its purpose as a digest of credit information, it serves as a department index to the credit files, whether or not the general correspondence numbers are used in the credit department.

PLANNING A CENTRAL FILING SYSTEM

The concentration of work under competent and specialized departments has become an essential to efficient organization. Executives have come to understand that more efficient filing service is possible if a central filing department is established and a trained filing expert put in charge.

A central file is not necessarily a general file but a group of files brought together in one department under one executive. Such files as legal, claim, credit, statistical, or data should never be merged but always kept separate.

So long as files remain scattered in departments, they are

usually operated by more or less haphazard methods. The secretaries, stenographers, and office boys under whose charge they must necessarily fall seldom have little if any knowledge of indexing or filing. These part-time file clerks file in odd moments—they transfer whenever convenient. Furthermore, any one wanting a paper takes it from the file himself, providing he can find it, and seldom takes the trouble to charge it.

The central files should be located nearest to the departments using them most. The floor plan in Figure 304 shows the relation of the central filing system to other departments.

The furniture in the filing department is so placed as to conserve floor space, save steps, make it most convenient for the work, and eliminate all possible waste of time and energy.

Some records—cards, papers, and printed matter—must be kept within the department where they are used con-



Figure 305: Filing and finding are no longer guesswork. Standardized systems and equipment and trained executives and clerks make the central filing department the hub of efficient office work. A typical filing department is shown above.

stantly. Such records should be under the supervision of the head of the filing department, who avoids unnecessary duplications, makes each file secure to its fullest capacity, and eliminates both the waste of time and energy involved in having the filing done by employees unskilled in this line.

The efficiency of any filing department depends on:

1. Complete, skilfully designed equipment and supplies for all kinds of materials to be filed and indexed;
2. Standardized systems adapted to the needs of the business;
3. Experts to help in analyzing the needs of the organization and show how desired results may be achieved;
4. Thoroughly trained file clerks.

The man who buys filing equipment will find that special service is rendered to business by the various companies which specialize in filing systems and equipment.

To aid business men in securing capable file operators, schools of filing have been established in New York, Boston, Philadelphia, and Chicago. Competent instruction in all methods of filing is given with the purpose of developing and training the student successfully to carry the responsibility of a filing position. Many business concerns have so appreciated the value of this training for file clerks that in a large number of cases they have sent their own clerks to the schools, bearing the expense of the nominal tuition fee.

So successful have the resident schools been in specialized training of young women, that in many schools a home-study course is offered. To accomplish this, the American Institute of Filing was founded in 1921. The course of study is the same as that of the resident schools. The text is sent in loose-leaf form to students, by lessons. Theory and practice are carefully blended. The actual practice work, which is such a vital factor in the training in the resident schools, is made possible by the production of all basic methods of filing in practice outfits or miniature sets.

XXXIV

FILING EQUIPMENT

Records must be properly housed. Filing cabinets: upright cabinets; counter-height cabinets; horizontal cabinets; trucks. Card cabinets and desk trays. Combination files. Card-record desks. Ledger desks. Ledger trays. Transfer cases. Steel storage shelving. Arch and board files. Supplies for paper filing: guides; folders. Card-record supplies: card guides; cards.

FIFTY years ago little thought was given to the relation between records and filing equipments; but the modern business man knows that not the least important part of every filing system is the cabinet in which it is housed. His selection of equipment, therefore, is determined by the amount of available floor space, by the size, shape, and value of the records to be indexed, by the frequency with which those records must be consulted, and by the system of indexing to be used.

Filing cabinets of all sorts to suit a diversity of needs can be had; they are made in all wood¹ and all steel² and in a combination of wood and steel.³

¹Wood filing equipment is manufactured by such companies as: Amberg File and Index Company; Browne-Morse Company; The Globe-Wernicke Company; The Macey Company; Rand Kardex Bureau; Shaw-Walker Company; Wagemaker Company; The Weis Manufacturing Company; Yawman and Erbe Manufacturing Company.

²Among the manufacturers of steel filing equipment are such companies as: All-Steel-Equip Company; Amberg File and Index Company; Art Metal Construction Company; Aurora Metal Cabinet Works; The Automatic File and Index Company; Baker-Vawter Company; Browne-Morse Company; The Berger Manufacturing Company; The Canton Art Metal Company; Columbia Steel Equipment Company; Corry-Jamestown Manufacturing Corporation; The General Fireproofing Company; The Globe-Wernicke Company; Invincible Metal Furniture Company; The Macey Company; Metal Office Furniture Company; Rand Kardex Bureau; The Safe-Cabinet Company; Shaw-Walker Company; Steel Equipment Corporation; The Van Dorn Iron Works Company; Watson Manufacturing Company; Yawman and Erbe Manufacturing Company.

³This type of equipment is manufactured by such companies as: The Automatic File and Index Company; Browne-Morse Company; The Globe-Wernicke Company; Shaw-Walker Company.

Wood files and wood-steel files are to be had from stock in oak, walnut, and mahogany; steel files in olive green, mahogany, walnut, or oak, or special finish to match other furnishings.

FILING CABINETS

Filing cabinets are built on the unit or sectional principle so as to provide adequately for the changing character and increasing volume of records. Each unit or section is a complete system in itself, but fits in with units added as the need grows, so that the system for the whole collection may develop almost indefinitely. The two methods of combining cabinets on the sectional plan are:

Upright: Units or sections of uniform height and depth arranged *side by side*;

Horizontal: Units or sections of uniform width stacked *one above the other*.

Vertical or Upright Cabinets. The drawers of an upright unit are arranged one above the other (Figure 306). Of uniform height and depth, these cabinets vary in width according to the size of the drawers. Extension slides make the drawers run smoothly, and followers keep the folders and cards in correct working position. As may be noted from Figure 307, vertical units are made in many distinct styles for as many different purposes, making it possible to meet the exact filing needs of any business.

Any number or arrangement of units may be combined in a row and any combination changed at will. A complete battery consists of a series of units joined together (Figure 308). End panels are usually needed to finish a battery of wood files. Most steel cabinets have finished ends, and, therefore, require no panels. In some cases, however, panels are optional on steel cabinets; in still other cases, panels are required for cabinets which are "open end."

When a drawer of the cabinet shown in A of Figure 309 is opened, the front tilts forward and the follower or compress-

or tilts backward, providing a nine-inch "V" spread of the contents, so that the letters and papers may be referred to without being removed from the file. This file may be purchased in wood-steel or all-steel construction.

A variation from the usual four-drawer upright cabinet is pictured in B of Figure 309. It stands four or five inches higher than the four-drawer file.

Counter-Height Cabinets. Counter-height units (Figure 310) are designed to meet the need for a filing cabinet and

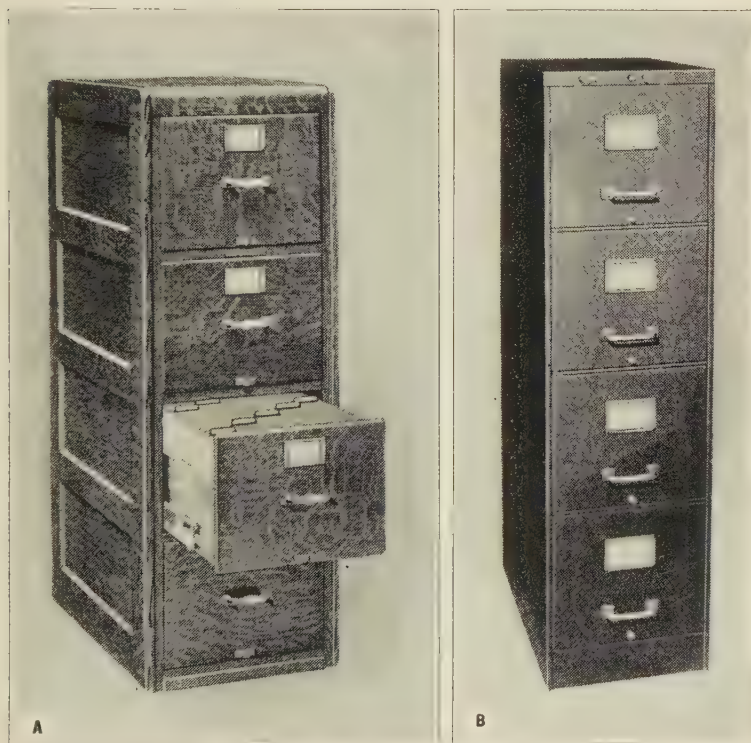


Figure 306: Unit construction of filing equipment has met with approval because, as explained on page 672, it provides for the growth of business records. As seen here, a unit (A is of wood; B of steel) consists of drawers arranged one above the other

counter combined. These units have four features: they separate the office from the public space for customers; serve as a partition between departments; furnish a convenient counter for working; and provide filing and storage space. They are particularly adapted for use in departments where reference is made to records, as in filing departments. Almost any style or shape of counter can be arranged to meet individual needs and can be expanded to keep pace with the growth of the business.

Horizontal Cabinets. Horizontal units (A of Figure 311) have the drawers arranged side by side, and the complete cabinet is formed by stacking one unit above the other. Such cabinets provide in sectional form a greater number of drawer sizes for the small office whose records are few but of varied styles.

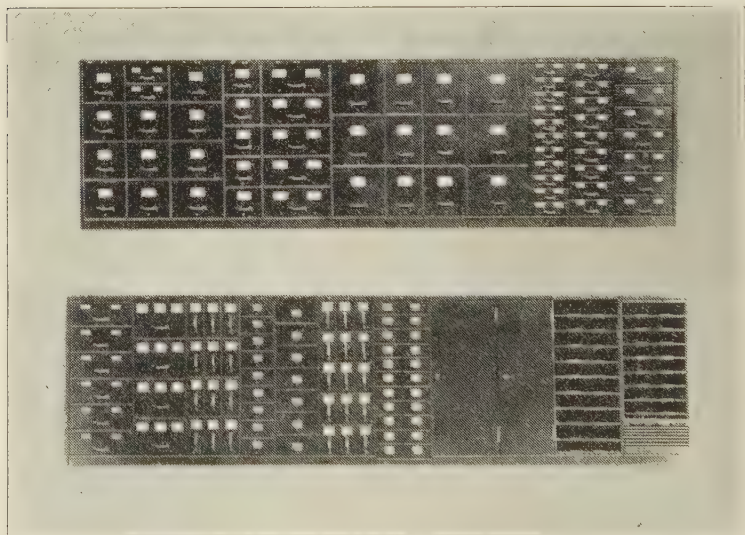


Figure 307: Cabinets, both wood and steel, have been designed for housing correspondence, legal papers, catalogs, vouchers, checks, bills, blue-prints, photographs—in fact, for every kind of business record, as indicated by the styles pictured above. Any number or arrangement of units may be combined to fill particular needs. See page 672.

The use of half-units greatly increases the flexibility of the horizontal cabinet. They meet the demand for smaller units than are found in the standard horizontal sections. Such a file is seen in B of Figure 311. They are ideal in their convenience and adaptability for the small office or for individual files in larger offices. Frequently, only a few trays or drawers of a certain size are desired. Thus, a beginning may be made with one unit, adding a section at a time as requirement demands. These units make possible the greatest variety of housing in the smallest space.

Vault Trucks. Built up of units to hold books, papers, and cards of all sizes, vault trucks, like the one illustrated in Figure 312, are used to convey records from one department to another and to carry them to and from the vault.



Figure 308: Unit or sectional files meet existing conditions at all times. They can be arranged in a long, single row or divided into groups, serving as partitions between departments. Such joining of units forms a battery.

CARD CABINETS AND DESK TRAYS

Card-index cabinets are designed for small card-record systems to be kept on desks, stands, or tables. Several styles are shown in Figure 313. The drawer files are made both single and in units and may be added to as the need grows. Desk trays offer an efficient means of organizing material to be filed.

COMBINATION FILES

To answer the many different needs which arise in the filing of records various styles of cabinets have been devised. The urgent need of protecting as well as filing material systematically has brought forth a new style of cabinet which offers safe characteristics. This means that the walls of the cabinets are constructed in much the same manner as are safes. The material of the walls, although not absolutely fire-proof, lessens the possibility of fire. A point of caution worth remembering is that where large quantities of papers are filed the fire hazard is great.

Filing cabinets of this type may be built in upright and horizontal styles. Visible index cabinets may also be constructed to give a higher degree of protection to records contained. Desks may also be constructed to give safety and at the same time afford convenience in handling the papers which are in constant use (see Figure 314).

CARD-RECORD DESKS¹

Wherever there is a great volume of posting or record-making office work, the card-record desk is available (Fig-

¹Made by such companies as: Amberg File and Index Company; Art Metal Construction Company; The Automatic File and Index Company; Browne-Morse Company; The Canton Art Metal Co.; Columbia Steel Equipment Company; The Globe-Wernicke Company; The General Fireproofing Company; The Macey Company; Rand Kardex Bureau; Shaw-Walker Company; The Van Dorn Iron Works Company; Wagemaker Company; Watson Manufacturing Company; Yawman and Erbe Manufacturing Company.

ures 315 and 316). A combination file and desk, it holds from 16,000 to 80,000 cards, depending upon the size of the record. It affords a most practical means of handling card records; every record is where it can be found instantly. Its practical advantages make it an ideal equipment for any purpose for which card records are used. Every card is within arm's reach. Desks are of unit construction in wood or steel and are generally used as a double wing with a desk posting section between, or as a single wing with posting section and supporting end. One type can be installed in battery formation—that is, the desks placed side by side in a long row or arranged in any other way that is convenient. The walls are of fire-wall steel.

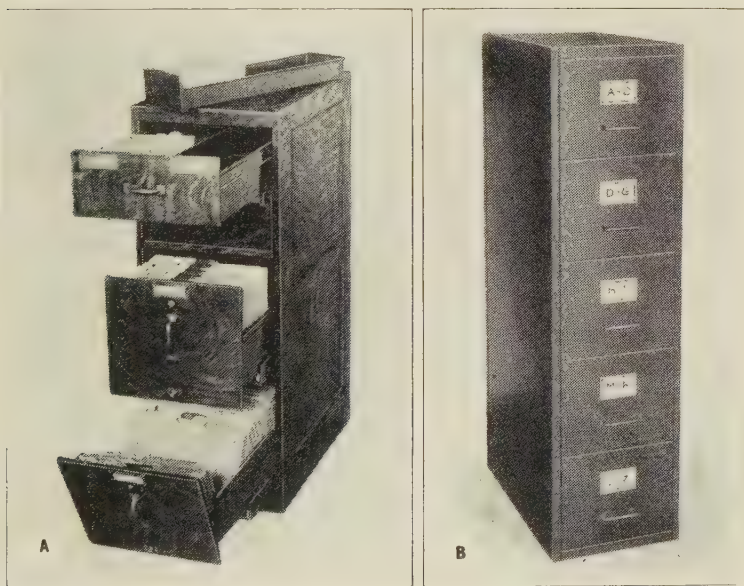


Figure 309: With a variety of styles from which to choose, the prospective user is bound to find one that exactly suits his records and his floor space. The cabinet shown in A is unique in that the front of each drawer tilts forward to allow extra filing space. Notice that the other cabinet, that shown in illustration B, has five drawers instead of four. These filing cabinets are described on pages 672 and 673.

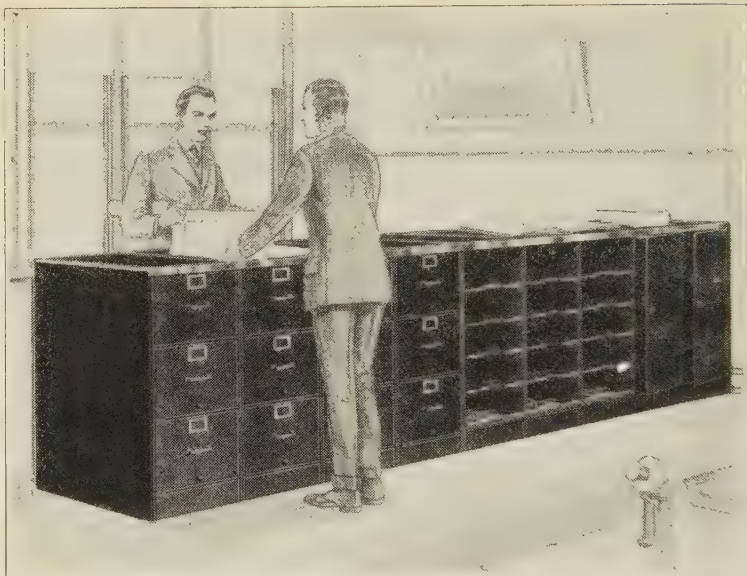


Figure 310: The need for a filing cabinet and counter combined is met by the type of file known as the counter-height. It also answers the demand for lower-height equipment. Numerous styles and kinds are obtainable and may be added to as desired. See page 673.

LEDGER DESKS

The standing steel card-ledger desk¹ is designed for ledgers to which frequent reference is made, often by more than one individual (Figure 317). It is the most convenient desk for savings banks where the teller or bookkeeper is going continually back and forth from his window to the ledger, making entries, or comparing the pass-book with an account. Reference is made without interfering with the person who may be working on the cards. While used extensively in

¹Made by such companies as: Amberg File and Index Company; Art Metal Construction Company; Browne-Morse Company; The Canton Art Metal Company; Columbia Steel Equipment Company; The General Fireproofing Company; The Globe-Wernicke Company; Rand Kardex Bureau; Shaw-Walker Company; The Van Dorn Iron Works Company; Watson Manufacturing Company; Yawman and Erbe Manufacturing Company.

banks, this type of desk is not limited to this branch of business; on the other hand, it has been readily adopted by commercial concerns.

For a small number of accounts, say 5,000, a sectional desk may be used. For the larger bank or commercial concern, a desk housing about 10,000 accounts is desirable, but both may be expanded by adding a half or full section.

A roller posting board with linoleum top for each section furnishes a working top and convenient reference space. Each section is equipped with a one-piece roll curtain or top, making the desk practically water-proof. Desks may be fitted with non-spilling ink-wells and proper conduits for lighting purposes.

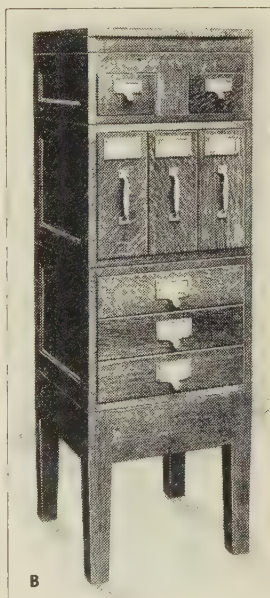
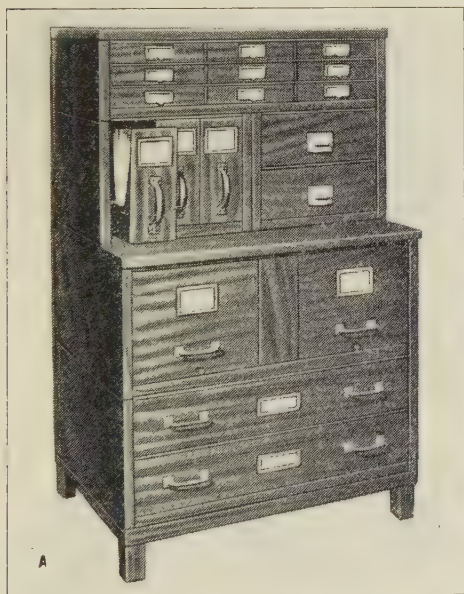


Figure 311: For a small office whose records are few, but of several kinds, horizontal cabinets, formed of units of uniform width stacked one above the other, offer a greater number of drawer sizes than vertical files. What is known as a wide section is illustrated in A; half-unit forms make up the smaller cabinet. See page 674.

LEDGER TRAYS

The card-ledger tray is designed to facilitate the handling of ledger cards (or leaves) when posting (Figure 318). On certain makes of these the right-hand side can be dropped



Figure 312: There is a filing equipment for every possible record-keeping need. A useful piece is the vault truck, which is designed to carry records from one department to another. Any desired units may be combined as shown here. For a description of this type of file, read page 675.

so that the balance on the lowest line is visible without removing the card from the tray. On others this necessary visibility is obtained through the use of a low side or of a follower block which easily provides a wider opening at the will of the operator. Some trays have both V-shaped adjustable followers and open construction to increase visibility.

Bottoms of sand-blasted aluminum, roughened fabric, rubber, cork, or corrugated steel, prevent cards (or sheets) from slipping. Followers and front angle plates are so de-

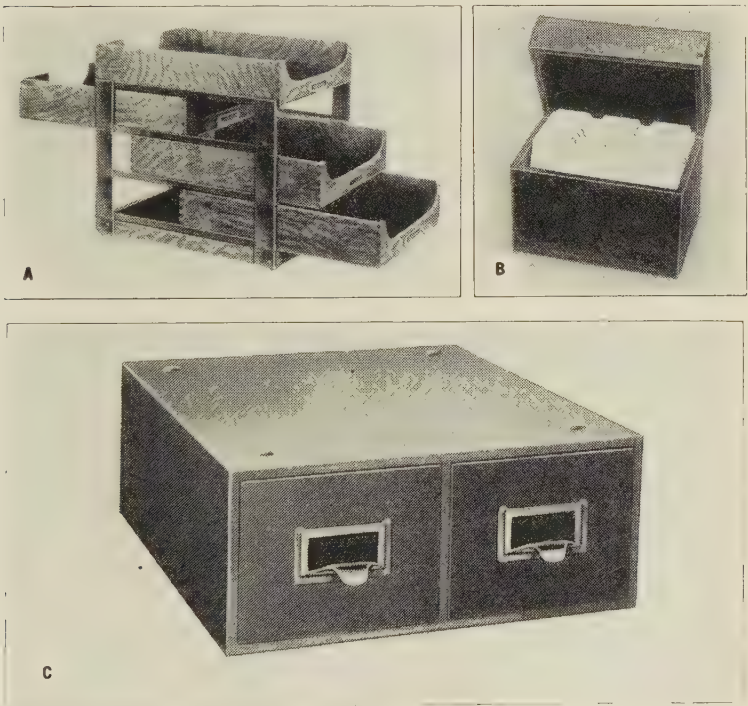


Figure 313: Three of the many styles of files for records that must be kept on the desk are shown here. The tray (A) holds incoming and outgoing mail; a card-file tray with a hinged cover (B) is used for cross-indexes and follow-up; card cabinets (C) serve as reference cases for small private files.

See page 676.

signed that the cards (or sheets) are always kept in convenient working position.

Trays of extra width, to allow offsetting of the cards after posting, can be had. They can be mounted on bases with casters and fixed wheels and are easily moved about or to and from the vault. Some bases are adjustable from sitting to standing height, each equipped with a shelf to hold the cover when the tray is in use. Many sizes are standard for use with practically any size of ledger card or sheet. Steel and juteboard transfer cases are also available for card records, canceled checks, and other records.

TRANSFER CASES

In most business offices it is the custom to transfer filed correspondence at certain times of the year. At such times the correspondence is taken from the main current files and placed in less expensive transfer cases or cabinets where it continues to be accessible for reference as long as may be necessary to the needs of the office¹ (see Figure 319).

Steel transfer cases are fire-resisting and furnish ample protection against dust, dampness, vermin, and mice. They may be bought one at a time and added to when necessary, or any number of units may be joined together into one stack or battery by intermembering one above the other or side by side. The wood case may be added to in the same way.

Another type of transfer case is made of wood heavily reinforced with binder tape, giving a firm and solid frame. A strong paper covers the case, and a slot is provided in the front side to allow the cases to be easily handled.

STEEL STORAGE SHELVING

Built on the unit principle, steel storage shelving provides a simple and yet strong, rigid, and durable shelving for use

¹For a description of transfer methods, read Chapter XXXIII, Filing Methods.

in vaults, storerooms, and offices for the storage of records of all kinds. In the supply room it is used for stationery and general supplies (Figure 320).

It permits unlimited expansion or rearrangement due to features of adjustability. It is reduced in manufacture to the smallest possible number of parts—base or top, shelves, upright, back, and finished end.

ARCH AND BOARD FILES

Temporary records are sometimes filed in the manner shown in Figure 321. All board files have locked arches and a hook by which they may be hung on the wall. They are



Figure 314: Filing cabinets may be constructed with safe characteristics. That is, the walls of the cabinet are constructed in the same manner as the walls of a safe, the thickness of the cabinet walls being, of course, on a smaller scale. This type of equipment may be built in various styles—upright, horizontal, or in the desk style pictured above.



Figure 315: In the use of card-record systems the question of doing the work at a minimum of expense is paramount. Because it holds thousands of records within easy reach, the card-record desk enables the clerk to concentrate and work steadily. A is a double pedestal desk of wood; another design of double pedestal unit is shown in B. Any number of units may be attached side by side.

adapted to the keeping of way-bills and invoices in railway offices; for the keeping of times and rates in factories; and for records of coal or water consumption and the filing of much handled data.

SUPPLIES FOR PAPER FILING

As the reader learned from Chapter XXXIII, Filing Methods, the necessary supplies for filing papers are guides and folders.

Guides. A guide is a heavy card usually the same size as the folders with which it is used. Upon a tab projecting above the body of the guide is written or printed the letter, number, or word which indicates what matter is filed behind it. When a rod is used in the drawer, it runs through a hole in an extension of the bottom of the guide.

In any filing system the guides serve as an index to the

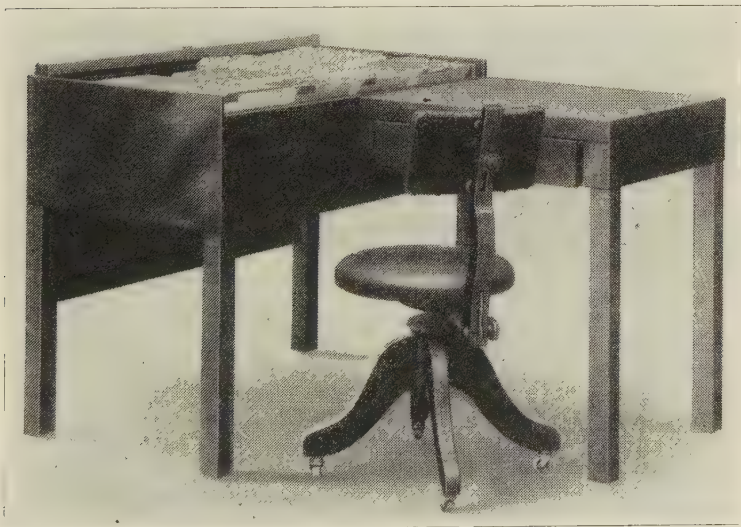


Figure 316: The card-record desk is a card file and desk combined. What is known as a single-unit desk is shown here. It consists of a card unit holding about 12,000 cards, a posting section, and a pair of end legs. See page 676.



Figure 317: This shows an installation of standing card-ledger desks. Such desks are combination desks and files, with space for as many as 15,000 cards, depending upon the size of the record.



Figure 318: Every piece of equipment that reduces the time an employee spends on a job reduces expenses. Ledger trays, because they keep the records in convenient working position, greatly facilitate machine book-keeping, as shown above. Page 680 tells more about these handy trays.

file and should be arranged to give the necessary reference with a minimum of "eye travel," to promote speed and accuracy in service. They are called on to stand the wear and tear of the filing system and their usefulness depends on the quality of the material used and the way in which they are made. The most generally used guides, made of heavy pressboard and, for less active files, of manila, come in all standard sizes.

Guides are commonly cut with tabs in halves, thirds, fourths, and fifths, as seen in Figure 322 which illustrates card file guides.

As explained above, the guide tab may be an extension of the body of the guide without covering or protection, and may be either printed or plain (A of Figure 323).

Illustration B of Figure 323 shows a tab covered with celluloid to protect it from finger marks and wear.

Besides the kind of a tab that is a projection of the guide

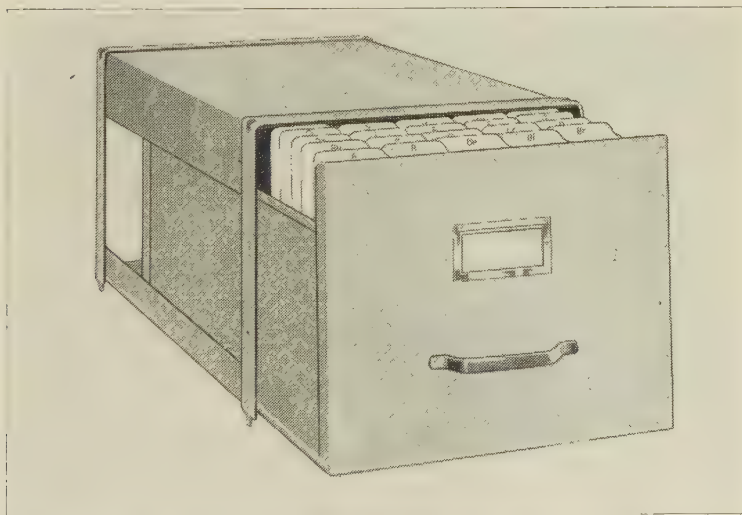


Figure 319: Many styles of transfer cases—described on page 682—provide storage space for correspondence to which only infrequent reference is made. This unit is of steel and may be added to as the demand arises.

card itself there are tabs which consist of a metal or celluloid frame into which the indexing label is inserted. Illustration C of Figure 323 shows such a tab. Another type of metal tab is angular so that the label shows at a slight angle to the guide card, thereby increasing visibility.

Figure 324 shows how the index label is inserted in the frame of a celluloid tab guide.

Folders. Folders are made in a wide variety of sizes,



Figure 320: Steel storage shelving also built on the unit principle may be added to as the need grows, or rearranged to fit new spaces. Such shelving furnishes storage space for all sorts of records and supplies.

shapes, colors, and grades. Each has its purpose, whether for hard usage in the active file or for holding transferred papers.

They are to be had in manila and strong pressboard, either with or without tabs. Several kinds are shown in illustrations A and B of Figure 325.

The folders may be made to fit in perfectly with the entire filing equipment. For this purpose there are various types. Straight edge and cut tab folders are popular styles. Expansion folders allow papers to be bunched into one packet. Binder folders with fasteners provide for empaling papers.

Folders with special printed labels, such as the names of the months or letters of the alphabet, are to be had. Also, folders can be printed to meet individual filing needs. For plain folders, gummed slips on which names are typewritten are furnished in strips.



Figure 321: A method of taking care of temporary records is offered by the arch and board file pictured above. A small perforator can be attached to the file board for perforating the papers that are to be hung on the file. See page 683.

By means of different-colored labels, folders containing different kinds of material for one firm may be easily differentiated, or various groups of correspondents may be classified.

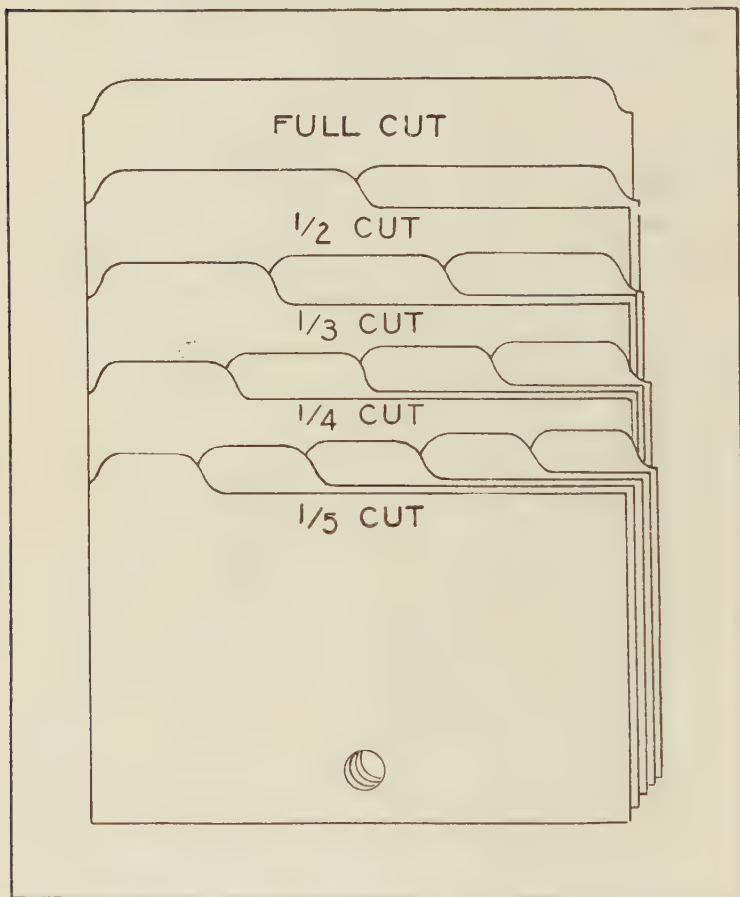


Figure 322: The main point of interest in any file is the speed with which a folder or card can be found. In order to secure the greatest efficiency, guides bearing letter, word, or number tell the file clerk what matter is filed behind them. These are card guides but, as you will learn from reading page 687, vertical guides are cut in the same way with tabs in halves, thirds, fourths, and fifths.



Figure 323. The tab is the most important part of a guide because it gets all the wear. Three kinds of tabs are shown here: A is a cut tabbed guide; B is a cut tab protected by a celluloid covering. C is of metal in which a label is inserted. Figure 324 illustrates another kind of tab. Read page 687 for a detailed description of each of these guides.

CARD-RECORD SUPPLIES

Cards and guides adapted to the numerous systems of card filing, as explained in the chapter on Filing Methods, are manufactured by the companies which specialize in such systems.

Card Guides. The best results can be obtained from any card record only when the record is properly indexed. The main point of interest in an index is the speed with which a card may be found. To secure the greatest efficiency, the index should be provided not only for the record as it is, but with ample allowance for expansion.

Records constantly handled must have guides sufficiently strong to stand the wear and tear and should be selected with this thought in mind. Manila, bristol board (some say), and pressboard are the materials used.

Guides may be furnished punched to fit any type of

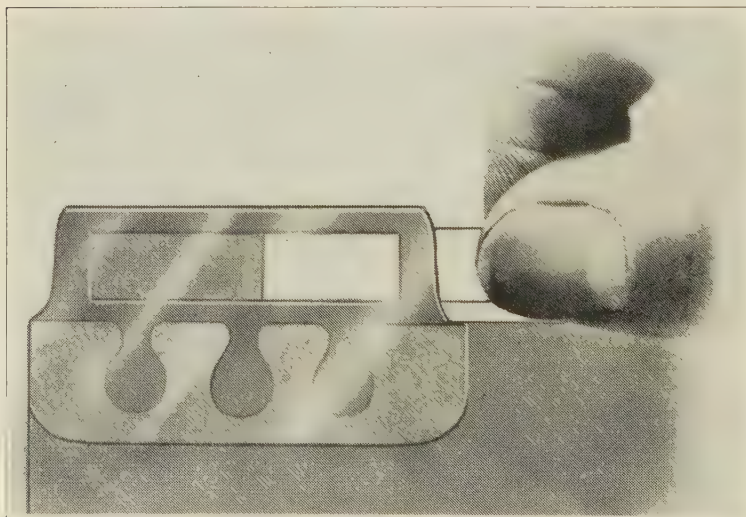


Figure 324: One kind of tab for a plain guide is made of celluloid. The removable label, inserted between the two layers of celluloid, is protected from soil and wear. The three varieties of tabs are described on page 687.

guide rod. The tabs for card guides, cut in the same way as paper guides, are of great help in outlining a system. Different colors are also helpful in arranging the file.

For any card record there is an index to fit the needs. The standard alphabetic indexes are made in subdivisions of five to one thousand in size. In addition to these are the standard printed month and day guides, geographical, town and country, and specially printed guides. Celluloid and metal-tip removable label guides are also furnished for blank guides.

Cards. It is equally bad policy to choose too good a card or too poor a card. The grade should depend upon the nature of the record. To buy cards that will last only part of the life of the record, means not only the expense of new cards when the first lot is worn out, but the greater expense of rewriting the record. Varying grades are obtainable—inexpensive ones for temporary purposes, medium grade, and the highest quality.

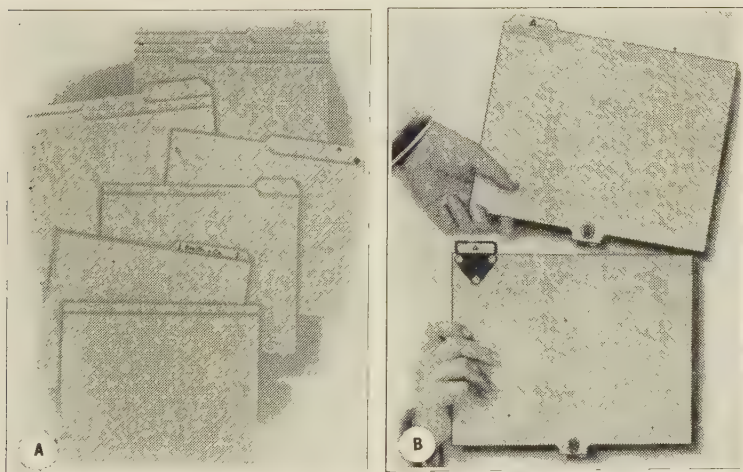


Figure 325: Correspondence and other material are filed in folders which may be purchased in a variety of styles. Some have straight edges, some have cut tabs, while others have metal tabs. Other styles are described on pages 688 to 692.

Most card-index systems can be made more efficient by the use of tabbed cards. Tabs show divisions of the alphabet, dates, subjects, or numbers, and make a perfect sub-index or cross-index to all filing systems.

The use of metal indicators serves to increase the efficiency of almost any card system to an enormous degree. They serve practically the same purpose as tabs on cards. These indicators are furnished in distinctive colors, blank, or printed with daily, monthly, or alphabetical subdivisions, and afford hundreds of different methods of cross-index arrangement.

Numerical and geographical files, credit files, real estate classifications, and insurance expiration files are only a few of the filing arrangements benefited and expanded by use of these signals. All printing on indicators is in a size and style that give maximum legibility for the available printing space.

A great variety of standard form cards, ruled and blank, for every line of business are obtainable in the various sizes (see Figure 326). Special card forms are designed for the use of real estate dealers, hospitals, clubs, churches, and public service corporations, in fact, for practically any business.

XXXV

VISIBLE INDEX SYSTEMS

Early experiments with visible record-keeping systems. Four types of visible indexes. Cabinet type: metal-hinged holders; wire holders; overlapping pocket; card carriers; die-cut or upstanding; slotted card holder; overlapping cut card. Vertical-visible or card drawer type. Upright type: rotating index; straight-track upright. Book-unit type. Book units combined with cabinets: one-way cabinet; two-way cabinet. Why visible indexes make records more valuable.

THE oldest known type of index was the bound-book index in which the names were arranged so as to be "visible" on ruled lines. As far back as 1865 this old form of index was used for indexing Government records, the records themselves being filed numerically. The difficulty with this original form of visible index was that the names were not adjustable so that new ones could be inserted between two others. The *Journal of the Patent Office Society* shows that in 1891 the first adjustable form of visible index having the narrow single line slips was patented. Earlier records of the patent office¹ show that in the year 1875 the first overlapping card record which today is known as the visible card record was perfected. This invention showed the adjustable self-spacing principle of overlapping cards. The cards were attached at one edge to wooden strips which lay in rows so that the title margin of the cards was exposed to view.

From 1875 to 1916 numerous inventions were produced, variations of the original overlapping type of visible card record. All of these inventions, however, were best adapted to cards of substantial thickness, such as are generally used in ordinary card indexes. According to the *Journal of the Patent Office Society*, "It heretofore remained to go a step

¹Those interested in the history of visible indexes should refer to the *Journal of the Patent Office Society* for a detailed account.

farther and provide for using record cards or slips of thinner stock approaching ordinary writing paper.”

In 1915 this idea was applied to a hinged element index providing a permanent equipment of card holders made of wire with enlarged spacing ends received in opposite channels of metal back leaf.

Another line of development of the loose-slip overlapping index was an outgrowth of the form of wall racks for cards most of which consist of series of spring clips or pockets fixed on a board, sometimes merely to hold miscellaneous cards.

These early visible recording devices were followed by many others, which like all other office appliances which speed up work, save time and money, and eliminate costly errors, gradually were recognized as indispensable.

Dating back to the earliest models of overlapping card records, now known as visible card records, inventors have constantly sought to reduce the space occupied by these records; in other words, to gain compactness. Many attempts have been made during the past 25 years to perfect each of the various types. Today visible record systems

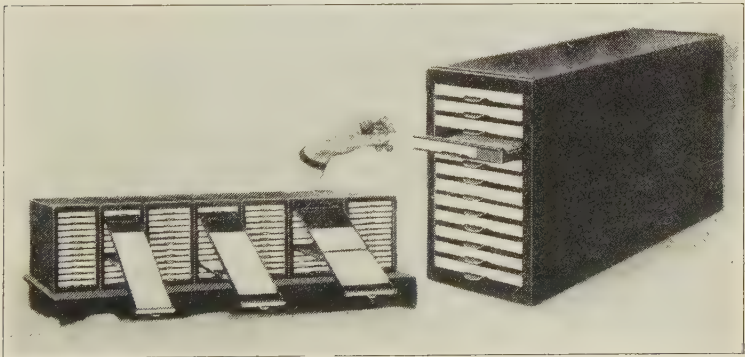


Figure 327: This illustration shows a method of combining several cabinet units into batteries. By arranging the cabinets side by side in one, two, or three tiers, batteries of unlimited card capacity may be obtained. There are many different methods of providing visibility. Read the section on cabinet types for a description of the various kinds.

are manufactured by several companies and they meet demand where speed in locating, posting, and properly using recorded information is necessary.

FOUR TYPES OF VISIBLE INDEXES

There are numerous kinds of visible indexes, which for convenience here will be classified into four groups. The

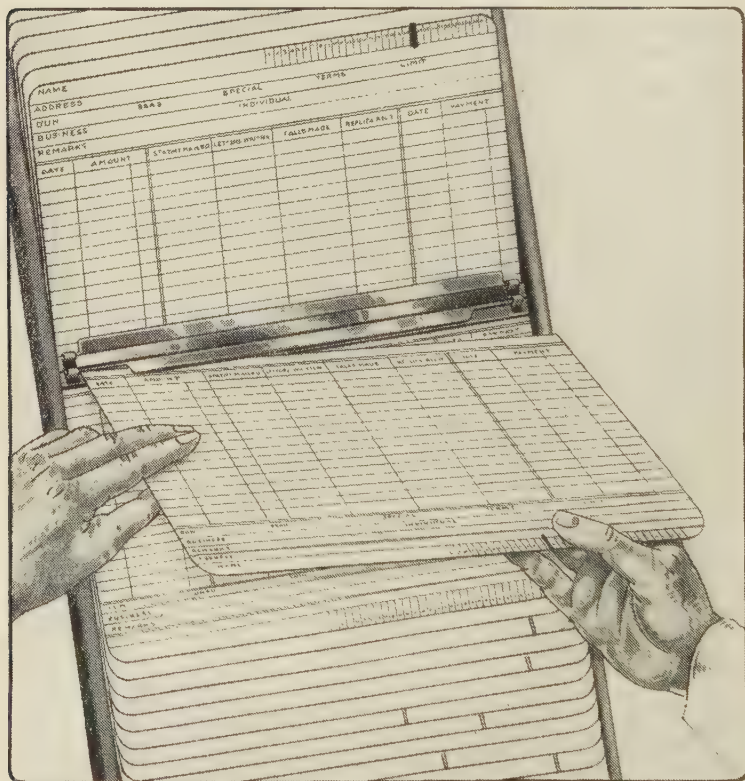


Figure 328: Here is the metal-hinged holder method of visibility. Note how the cards are placed in the hinge and arranged so that a new card can be inserted at any position, and so that any card can be removed without disturbing the other cards. Also note how the cards overlap, showing the index data visible on the bottom of each.

four types are cabinet, vertical, upright, and book-unit visible indexes.

The cabinet type houses the records in drawers, panels, or slides which fit into a steel cabinet. The cards are mounted on the panels or placed in the slides so that they overlap, showing only the title line of each card. A slight lifting movement reveals the entire card. Signals designate the classification of each card. The slides rest at a convenient angle for posting or may be easily removed from the cabinet entirely. Like sectional bookcases, these cabinets may be obtained in multiple units and added to as the list grows.

The vertical type consists of an aluminum tray and lock rod. Guide cards of the usual file cabinet type permit indexing.

The upright type carries the cards buttoned on or inserted in panels. These panels may be hung vertically on a circular track which rotates at the touch of a finger to bring the panel with the desired card before the eye; or on a straight track so that they turn like the pages of a book.

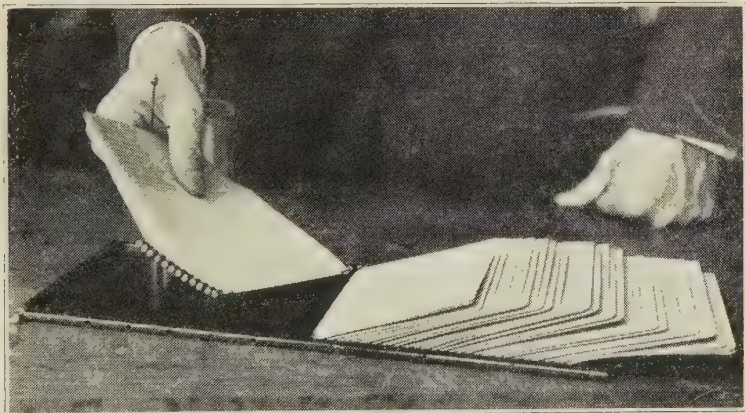


Figure 329: The wire holder type is equipped with flexible rods which are just long enough to fit in the panels. The card or form which is used is folded in the center, a rod is inserted in perforations in the fold, and the ends of the rods are slipped in the channels of the panel at any desired position. See page 704 for further details.

The visible book units are of two classes: first, those which use panels on which cards are mounted, and second, those which fasten the record sheet into the binder separately like a loose-leaf ring binder.

CABINET TYPE¹

The index which houses its records inside a cabinet is called the cabinet type. This type has cards attached to card holders which are operated in cabinet trays. The trays may be pulled out at a convenient angle for posting, or removed from the cabinet entirely. They are of steel unit construction and are interchangeable.

The cabinets are made in a variety of sizes and for compactness may be combined into batteries. By arranging the cabinets side by side in one, two, or three tiers, batteries of unlimited card capacity may be obtained. Figure 327 shows how this can be accomplished. Cabinets are mounted on steel stands with sliding shelves which provide a convenient writing surface.

Although all makes of the cabinet type follow along the same line of construction, the means of holding the cards in the trays vary. There are, in fact, seven means of attaining visibility: first, by metal-hinged holders; second, by wire holders; third, by lugs attached to overlapping pockets; fourth, by card carriers; fifth, by die-cut or upstanding cards; sixth, by slotted card holders; and seventh, by overlapping cut cards. Figure 327 illustrates two indexes of the cabinet type.

*Metal-Hinged Holders.*² The cabinets which are designed with steel hangers attached to an ordinary card turning on a movable steel card hanger are here called the metal-hinged

¹Visible indexes of the cabinet type are manufactured by such companies as The Aluminum Company of America; The Globe-Wernicke Company; Postindex Company, Inc.; Rand Kardex Bureau; Ross-Gould Company; The Weis Manufacturing Company.

²Metal-hinged holders are manufactured by such companies as The Globe-Wernicke Company.

type. The card hangers are manufactured with a hinge device which makes it possible to turn the card freely for reference on the reverse side (see Figure 328). This feature gives double entry space.

The cards are arranged in the panel so that a new card



Figure 330: The overlapping pocket type illustrated above maintains its principle of visibility by means of lugs attached to heavy craft paper card holders. A transparent tip protects the visible portion of the card form. Each card pocket will hold one or more cards on both front and back.

See page 704.

can be inserted at any position, and any card can be removed without disturbing the remaining cards. Thus, strict alphabetical or numerical order can be maintained although the number of cards filed increases daily. Figure 328 shows how the card is inserted in the hinge and also illustrates how the cards overlap to afford visibility.

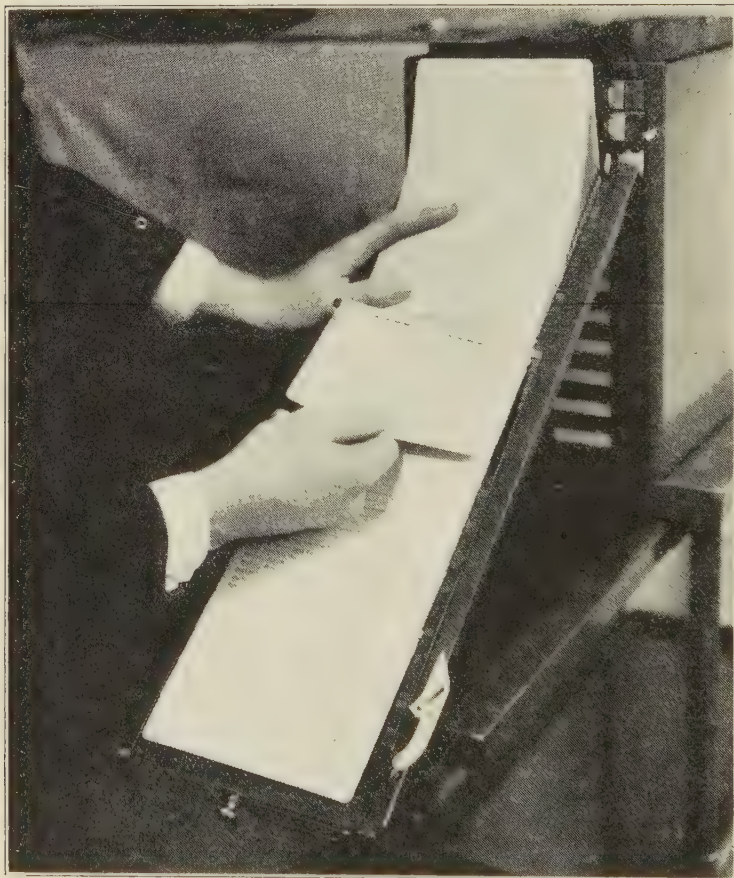


Figure 331: Visibility is attained by this type of card carrier by means of rigid bars, the ends of which engage in the channels on both sides of the tray. Note the lever on the right side of the tray. This device releases the channel so that carriers may be added or removed. See page 705.

Auxiliary sheets fit over the index cards, when the original card has been used, thus adding four pages of record space with each sheet used. The master card containing the valuable reference data is not removed and no information needs to be transferred; thus the index on the master card

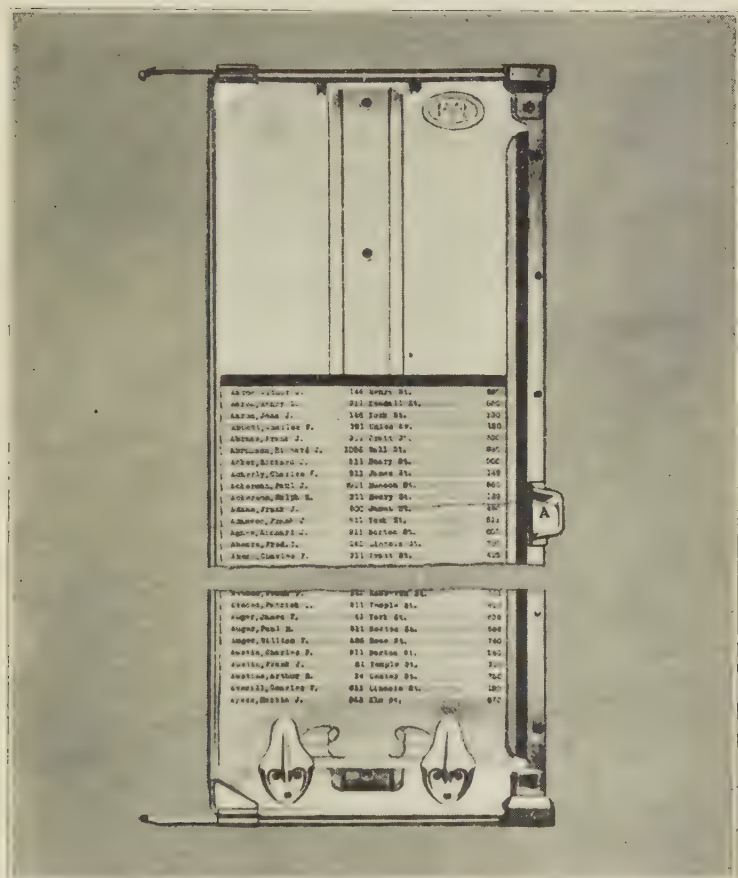


Figure 332: The cards of the die-cut type are buttoned on a metal bar or runway and slipped down behind the card below, as this illustration shows. By changing the position of the die cut, the amount of visibility on the card may be regulated for one, two, or more typewritten lines. Hinged cards may be used to give access to both sides of the cards without removing them from the file.

continues to serve. It is interesting to note that a system of color signals may be used.

*Wire Holders.*¹ Cabinets consisting of trays or panels are equipped with wire card-holders or flexible rods which are just long enough to fit into the panels. Each end of the wire terminates in a trunnion or cylindrical knob which operates in the channel of the panel and acts as a spacing means as well as an insurance of perfect visibility and alignment. The flexibility of the rod makes it very easy to slip it into place or to remove any rod and replace it.

With this type of visible index it is possible to use either cards or regular ledger forms. The card used with the wire holder offers a large writing space as each form is folded in the center. A rod is inserted in perforations which are at the fold, and the ends of the wire slipped in the channels of the panel at any desired position (see Figure 329). If a greater amount of writing space is required, the rod may be inserted through the perforation of several forms folded together.

The cabinets are made in varying sizes providing many different sizes of forms to fulfil the needs of the various kinds of work. The forms used are also made up for special types of business or work.

*Overlapping Pocket.*² The overlapping pocket type maintains its principle of visibility by means of lugs attached to heavy craft paper card holders. These lugs interlock and give uniform visibility in title margins. The transparent tabs which are fastened to the bottom of the card holders make possible the insertion of cards, and protect the visible portion. Holders and cards are removable for index changes. Such shifts are easily accomplished and make expansion a simple matter. Card record forms for use with this system

¹Wire holders are manufactured by such companies as Postindex Company.

²Manufactured by such companies as the Rand Kardex Bureau.



Figure 333: A slotted guide card, which is inserted in the panel, holds the index or posting cards in place. Note how the card may be turned back so that both sides can be used. Any card can be removed from the panel and a new card inserted by merely slipping the cut tab of the index card into the slots of the guide.

are printed in two ways—individually or in strips. Note the overlapping pocket arrangement in Figure 330.

*Card Carriers.*¹ Visibility is maintained by the card carriers by means of rigid bars the ends of which engage in the channels on both sides of the tray. A small finger lever releases the channel on the right side of the tray so that carriers may be added or removed. Each card is equipped with little notches near the edge. By slightly flexing the card it may be engaged or detached from the security disks of the carrier (see the index in Figure 331).

*Die-Cut or Upstanding.*² The cards of the die-cut type

¹Manufactured by such companies as the Rand Kardex Bureau.

²Manufactured by such companies as the Rand Kardex Bureau.

have two semicircular slits which are buttoned to a metal bar or runway and slipped down behind the card below, the bottom of the card resting on the slit of the next card, thus leaving the top or index line of each card visible. By changing the position of the slit, the amount of visibility on the card may be regulated for one, two, or more typewritten lines. The margin of any one card may be increased by the use of an "elevating" card, thus preserving the compactness of the system as a whole. The cards may be inserted or removed at any place and transferred in groups in one operation by the use of a transfer strip. Auxiliary

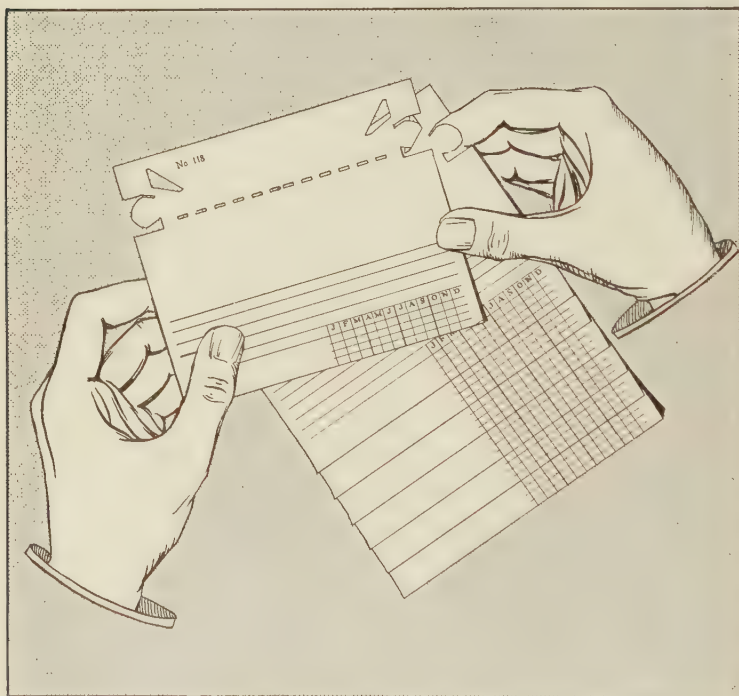


Figure 334: When the top of each card is cut as these cards are, they may be "hinged" together one over the other as the illustration shows. The flexibility of the cards allows them to be easily turned back for entry upon the next card. See the section on overlapping cut cards.

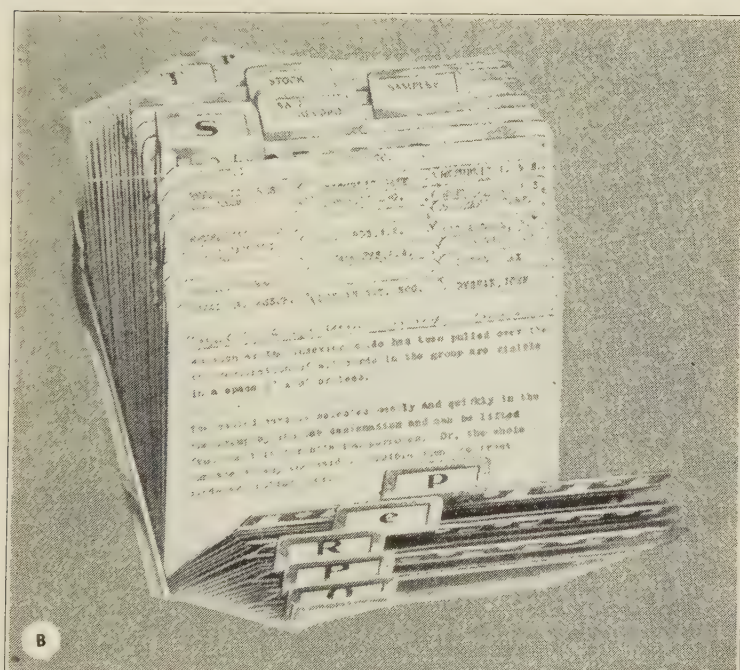
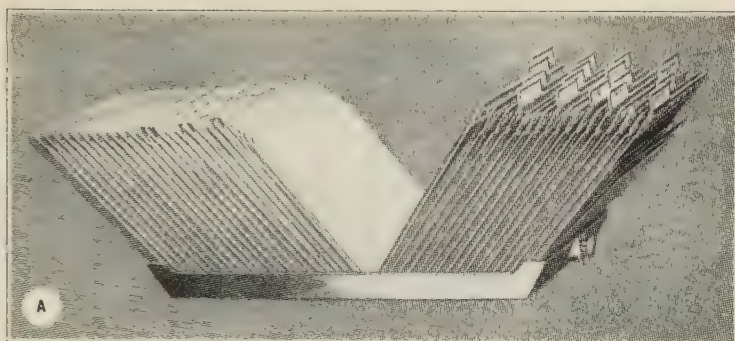


Figure 335: This type of visible file is designed to combine the element of visibility for each record carried, with the compactness, accessibility, and low cost of the ordinary card index drawer. Note the aluminum guides of the usual card drawer type with adjustable and insertable tabs. The full surface of the card is visible when the intervening ones are thrown over.

See page 711 for further details.

cards giving 2, 4, or 6 pages of writing surface may be buttoned on to the master card if desired. Hinged cards, of either the upstanding or down-hanging design, may be used with this style so that the cards can be easily turned to enter records on both sides. By the use of signals and

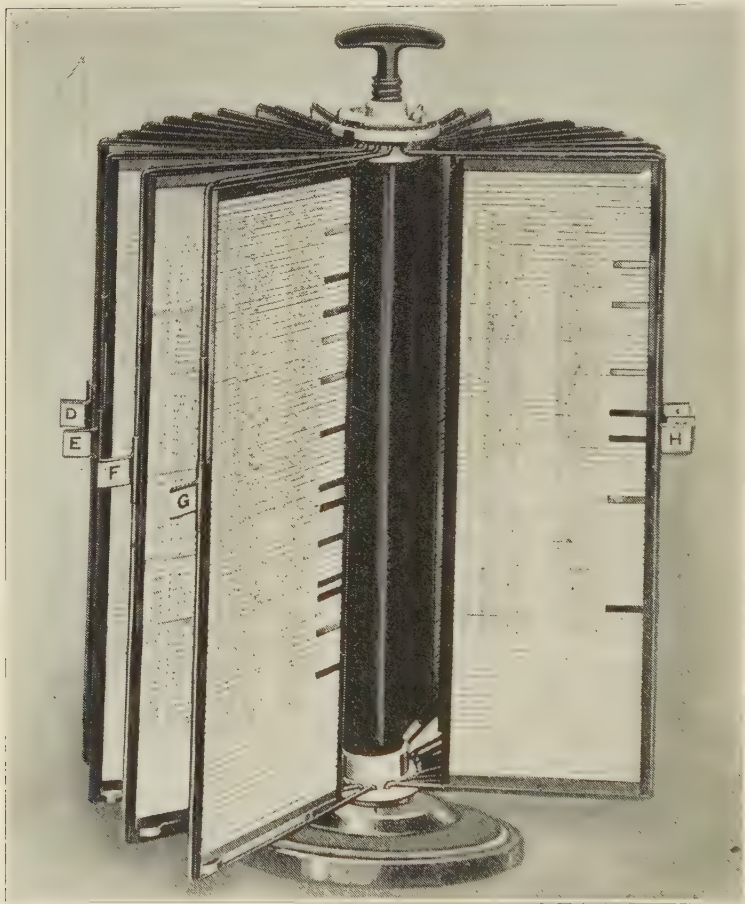


Figure 336: The rotating upright type is a convenient and compact method for reference work. The entire file rotates and each panel swings into position. Note the index tabs on each panel. The cards may be inserted in the panels in numerous ways. Here, the tube method is illustrated. For a description of this method, see pages 711 and 712.



Figure 337: A straight-track upright file offers an efficient method for reference work. This illustration shows how the panels are hung on two parallel tracks. Each panel may be moved from one side to the other. Several of these files may be used together to give an unlimited card capacity. See page 713.

classification guides, records may be flagged and classified in numerous ways. Figure 332 represents the die-cut type.

*Slotted Card Holder.*¹ This cabinet type of visible index maintains visibility by means of slotting the panel or guide card which fits into each panel or drawer. These slots are spaced so that the index or posting cards, which are also specially cut, can be inserted with overlapping edges. The method of cutting the lower edge of the index card makes it possible to hold it securely in place when inserted in the panel card; at the same time it gives flexibility. In fact,

¹Manufactured by such companies as The Weis Manufacturing Company.

Each card may be turned so that both sides are accessible for posting and notation. Figure 333 gives an idea of how the cards are arranged in the panels. Also note the style of cabinet.

*Overlapping Cut Card.*¹ Visibility is attained by the index shown on page 706 when the upper edges of flexible cards are attached one overlapping the other by means of a cut design as the illustration pictures. A card is easily inserted or disengaged by simply bending it and slipping the knob-like projection at the upper edges of the top card into or out of the three-cornered opening of the next card. The cut pattern is spaced so that a half-inch to a one-inch visibility is maintained. The lower portion of the card may be printed with lines and other forms to meet the requirements for recording records. This portion of visibility gives a continuous record when numerous cards are inserted in a card sheet panel. By merely glancing down the cards the status of the records is attainable.

Color signals are used to give a graphic picture of the records as a whole, and also to give a finer classification. Colored cards may be used for this purpose or colored flags may be clipped to the cards. In fact, a very highly organized system of signaling can be worked out.

The color signal system is sometimes used in connection with the index tabs. It is possible to put a steel index on each card sheet panel. By using different-colored tabs for the different kinds of indexes, as states, alphabetical letters, and so forth, the signaling and indexing are accomplished with one system. This method, furthermore, assures accuracy in filing, as the color immediately indicates the location of the class where the card belongs.

As has been stated, the cards may be inserted in panels. The panels may be filed in steel sections which are divided into narrow compartments to keep each card sheet or panel standing on its own edge. This upstanding position facili-

¹Manufactured by such companies as Ross-Gould Company.

tates the removal of card sheets. It is interesting to note that the card sheet panels may also be used in any standard legal-size file cabinet or in desk drawers.

VERTICAL-VISIBLE OR CARD DRAWER TYPE¹

This type of visible index consists of an aluminum tray and lock rod (somewhat like a card drawer with the sides and ends cut down), tabbed cards of different heights so that a portion of each tab is always visible, and aluminum guides of the usual card drawer type with adjustable and insertable tabs to permit any form of indexing desired. The pulling forward of a guide exposes the tabs of a group of 24 cards and the full surface of any one card is visible when the intervening ones are thrown over. (See Figure 335.)

The cards are held in the tray by the rod but can be detached and lifted from the tray for entry purposes; when a card is removed from the tray its absence is indicated by an "out" signal until the card is returned to the tray. Records are either written or typed on the visible cards (the cards being ruled or printed as desired) or a type of card is furnished with holding ears and slots by means of which existing records on ordinary type cards can be carried. The complete unit is portable and is designed to be stored in certain of the stock vertical units produced by the various file cabinet manufacturers.

UPRIGHT TYPE²

The system which places the index in an upright position so that the data there filed are directly before the eye is here called the upright type of visible index. The cards of the upright index are placed in panels in the same man-

¹Produced by such companies as The Aluminum Company of America.

²Manufactured by such companies as Rand Kardex Bureau; Postindex Company.

ner as those of the cabinet type. For compactness and economy of space, the cards are inserted in both sides of the panels and the panels are hung vertically and hinged so that one panel after another may be turned for reference.

There are two kinds of this type of index; one the rotating kind which arranges panels around a vertical center track, and the other, the straight track which attaches the panels to two parallel horizontal tracks or bars.

Rotating Index. When the index cards are inserted in panels which are attached to a center upright bar and so arranged that the entire file rotates, it is called the rotating index. Figure 336 shows how these panels are arranged.

The cards are inserted in the panels in several different ways, depending upon the make of the file. In every case the principle of arranging the card is the same as that employed by the cabinet type of the same make. For example, die-cut cards may be interlocked to an aluminum runway, the bottom of the card resting on the die cut of the next card, thus leaving the top or index line of each card



Figure 338: One type of panel book units is shown here. Note that the panels swing from a horizontal to a vertical position. Each panel is indexed and can be removed from the base. For a further description, see page 715.

visible. Flexibility is maintained by swinging the panels on ball hinges on the track of the rotating frame. A second method is called the tube method. The information desired is written on one line of a perforated strip; the typed section is then torn off and inserted in transparent tubes which are inserted under opposing channels of steel panels. By a third method, cards may be inserted in pockets and the pockets inserted under opposing channels on the steel panel. A fourth method consists in hanging cards on wire holders which are sprung under the channels as in the second and third methods. By these last three methods the panels are then inserted in holes around the center of a rotating frame.

Straight-Track Upright. Panels which are hung on two parallel tracks compose the straight-track upright index. Figure 337 shows how the panels are arranged.

The panels may be moved from one side to the other, as the cards are filed on each side. By simply turning the panels, any name or desired information is found. As described in the rotating index, the straight-track upright index employs the different methods of inserting the cards in the panels.

BOOK-UNIT TYPE¹

As has already been stated, there are two distinct types of book units: those which use panels in which cards are placed, and those which fasten record sheets into the binder as in a loose-leaf binder.

The individual panels are inserted in the cover just as the leaves of a binder, each panel being equipped with an arrangement for holding cards. The principle of visibility differs slightly in each make, but in general principle the book units are the same. Either the standard system of each manufacturer, as explained in the description of the

¹Manufactured by such companies as Accounting Devices Company; The Brooks Company; The Globe-Wernicke Company; Postindex Company; Rand Kardex Bureau; Ross-Gould Company; Visible Records Equipment Company.

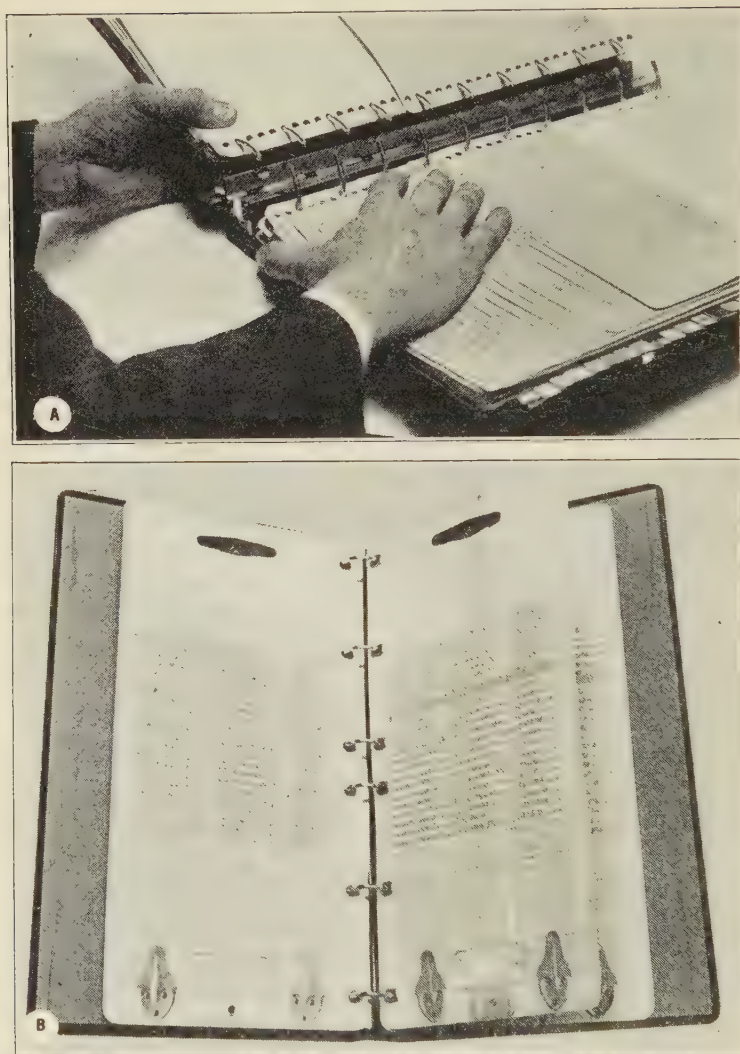


Figure 339: Two different styles of the book-unit type are shown here. Although the method of visibility varies, the leaves of both styles are held in place by means of metal rings. Note the overlapping method of visibility in illustration A; also note the die-cut type of visibility in illustration B.

See page 715.

cabinets, or the tube system, as explained in the discussion of upright indexes, may be used in book units.

Figure 338 shows a unit which is composed of panels that swing from a horizontal to a vertical position and which are so arranged that they hold forms visibly indexed. Five, ten, fifteen, or twenty panels each may be mounted on a steel base to form a unit. Each panel is indexed and can be easily removed from the base for desk work, so that several persons can use them at the same time.

The record sheet book unit is a combination of the ring binder idea with the visible or overlapping record idea (see Figure 339). In this type of equipment, a binder having half-round rings holds the division sheets and the individual record sheets in position. The individual sheets are held in overlapping position leaving a fraction of an inch on each sheet visible.

The binder is so arranged that it will open at any point for insertion or removal of sheets. It is provided with an automatic shifting device which opens the space for a new sheet or closes the space where one has been removed.

BOOK UNITS COMBINED WITH CABINETS

One-Way Cabinet. One system of using the book units combines it with a cabinet device which holds the book units so that several units may be used together to form a whole system. The filing cabinet which is supplied for holding the books facilitates their use, as it is arranged in compartments into which the books may be placed. When the cabinet is in position upon a table or desk directly before the operator, each book is within easy reach. The books are so placed in the cabinets that they may be pulled out upon the desk in the proper reference or posting position.

Two-Way Cabinet. The system which combines the book unit with a cabinet type, thus giving access to the book units from both sides, is called the two-way cabinet type

This is accomplished by constructing the cabinet so that the back and the front are both open and by making special arrangements so that the book units can be pulled out from the cabinet and placed back into the cabinet as easily from one side as from the other. Figure 340 shows how the two-way type of cabinet can be placed between two desks to allow two persons to refer to the file at the same time.

WHY VISIBLE INDEXES MAKE RECORDS MORE VALUABLE

With the visible index each individual account is directly in view, and this eliminates the necessity of handling many cards or leaves to find one desired account. Obviously, a business obtains more benefit from this type of record, since information is always instantly accessible. And, because of its simplicity and ease of operation, a visible index system encourages the use of facts and figures in deciding and planning, thus making accuracy take the place of guesswork in the management of the business.

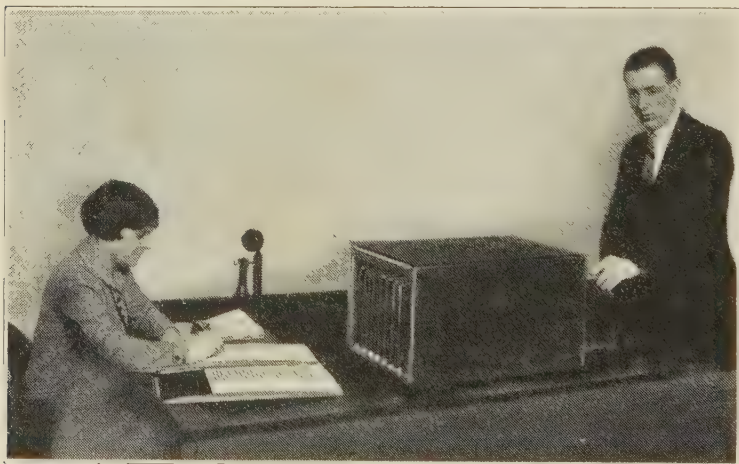


Figure 340: One of the book-unit types which is combined with a cabinet is shown here. This illustration shows how the book units may be used at the same time by two persons. Several cabinets may be used together to form a battery of index files. See page 715 for further details.

With each type of visible index, color signal systems may be used, as a means of calling the attention to pertinent facts. The signaling system acts as a control and also as a classification of facts. It gives in one glance a complete picture of the entire list, showing the status of certain classes.

To illustrate the use of the visible index, let us see how it may be operated in a bank on the stop-payment register. The equipment consists of a single wall panel hung in each teller's cage. Always visible to the eye are the name of maker, name of payee, check number, date, and amount. With this instant record before him, a teller loses no time in referring every check that comes to his window. Since the indexed cards may be instantly inserted and removed, the list may be kept up to date with very little detail.

When signature cards are carried on the card record, the eye instantly locates the depositor's name and a flip of the finger exposes the depositor's signature for comparison. By means of color schemes, the various conditions of accounts may be designated. The same principle is applied to identification records in safety deposit vaults.

In department stores, just as mechanical systems of communication have supplanted the cash girl, so visible records for credit authorization are rapidly taking the place of blind card files. It is now common practice to maintain complete visible files of accounts for credit authorization, and in many stores duplicate files are also used in the delivery department, in the telephone order department, and so forth, to speed up service.

Besides the uses above mentioned, a long list of uses of visible index systems might be given, if space permitted. Briefly, however, such uses as the following may be listed: sales ledgers, purchase ledgers, instalment ledgers, sales analysis and statistics, sales distribution, sales promotion, customers' records, contract records, price and quotation records, purchase records, stock records, cost records, employees' records, and wage records.

The above only give an idea of the multitude of pur-

poses for which a visible index or visibly indexed card records may be used. Banks, hotels, department stores, public utility companies, governmental departments, in fact, all kinds of businesses, from the large corporation to the small one-man shop, have found greater efficiency and increased profits resulting from the use of visible records.

XXXVI

FINDING AND FILING DEVICES

Why mechanical filing devices are needed. Three distinct methods of selecting data: numerical selector; class-name selector; group segregator. Finding and filing problems solved.

FOR many years the specific purpose of filing business data—namely, that they might be readily accessible to business executives—was defeated by the very inadequacy of the filing methods used. A great deal of time, money, and effort was expended in compiling pertinent facts in digest form, but they were usually difficult to find and quite often lost because of the manner in which they had been filed. The fact that human agents were employed to do this work was greatly responsible for the problems which arose. Errors and omissions due to carelessness and fatigue, which are common factors when finding and filing are entrusted to the hand process of individuals, were frequent occurrences.

It was in answer to the need for a more accurate and less expensive method that the growth and development of present-day mechanical filing devices can be traced, and today these devices render a valuable service in many fields of the commercial world.

The growth and development of finding and filing devices came as a result of the introduction of the card index 30 years ago. Since that time many systems of classification and identification of records have been developed. With all of these, however, there had been but one arrangement of order in filing. The perfection of three distinct mechanical devices, each of which is different in construction, operation, and purpose, marks an important stepping-stone in the history of filing.

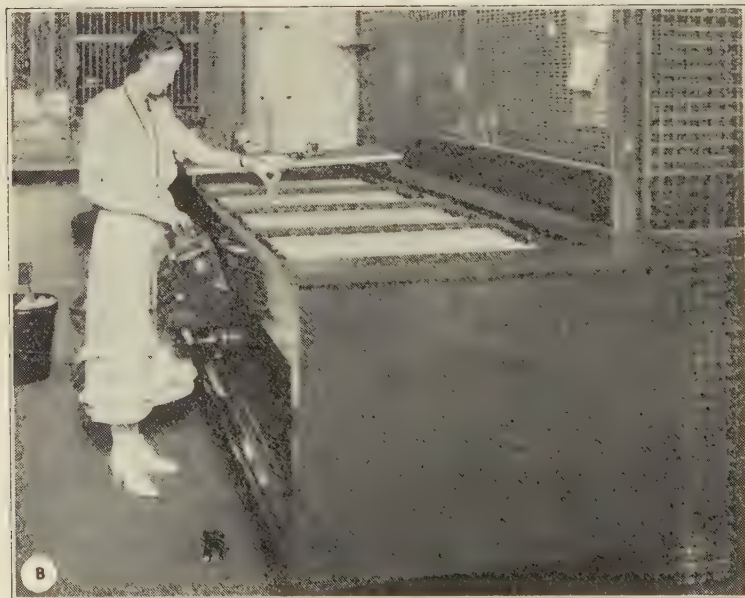
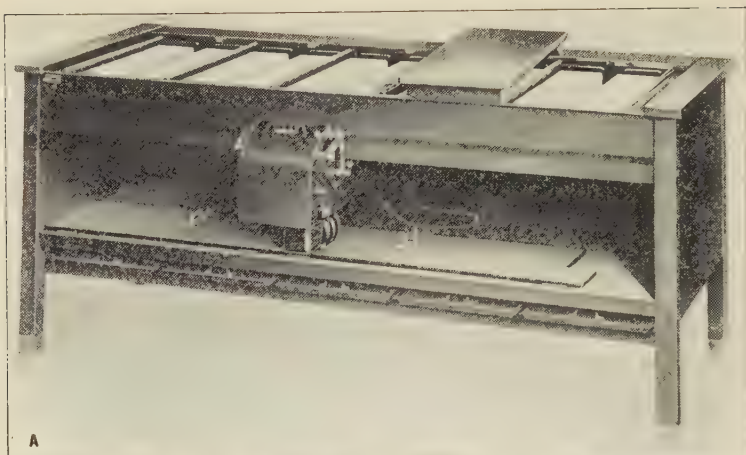


Figure 341: With the device illustrated, any one card of 10,000 may be instantly filed or found. Note in illustration A the selector, which serves only one tray at any one time, but is easily moved from tray to tray. Illustration B shows the device in actual use. Merely pressing a key of the indicator ejects the desired card. See page 721.

THREE DISTINCT METHODS OF SELECTING DATA

In consideration of these three methods or devices the basis of classification may be most accurately made, according to the specific purpose for which the machine was designated. The first of these to be described selects numerically; the second makes selections according to class name. The third operates principally for the sorting of groups of similar material. All three, however, share the common purpose of simplifying the finding and filing of data in digest form. In the following paragraphs these three devices will be taken up individually and their methods of operation explained.

*Numerical Selector.*¹ The first system or device may be termed a numerical selector because it operates for the finding of a single card and finds it numerically. Figure 341 illustrates this device, which consists of a metal, desk-like cabinet in the top of which are 10 metal trays each accommodating 1,000 cards, numerically filed. Each card bears a four-digit number. The first digit indicates the tray in which the card is to be filed, while the last three digits indicate the position of the card in the tray. Suspended from under the trays is a machine called the selector, which automatically picks out any desired card in any tray. This machine serves only one tray at any one time, but is easily moved from tray to tray.

The selector has a keyboard of 10 operating keys, a reset key, and a multiple digit key, and is provided with safety locks as a protection against careless operation. With the machine in operating position under any desired tray, the operator presses consecutively the three keys corresponding to the last three digits in the number of the card that is wanted. After the third key is pressed, the wanted card is immediately raised above the remaining cards. The card is then accessible for reference or removal without touching

¹Manufactured by such companies as the Add-Index Corporation.

the file or fingering over any cards not desired. The same method is used in filing cards. The card which directly follows the one to be filed is selected by means of the consecutive number, thereby supplying a positive guide for filing. Cards are easily found at the rate of 20 a minute and filed at the rate of 16 a minute.

Cards that are misfiled within 10 places of their proper positions are found in the same manner as a single card. Cards radically misfiled or entirely missing are detected by the use of the digit key, which raises together all cards of any chosen final digit. When these are raised, misfiled or missing cards are detected at a glance by reason of congestion or breaks in the spacing of the cards raised.

The machine is constructed so that it may be closed to form a metal cabinet resisting fire and water. Thus it provides for additional protection of valuable records. This device is made in several different sizes. The small model accommodates only one tray of 1,000 cards and can be used to great advantage when one set of cards can be worked on at one time. Other devices accommodate 8, 6, and 4 trays with a capacity of 8,000, 6,000, and 4,000 cards respectively, the cards being any standard size.

*Class-Name Selector.*¹ The second device for finding and filing may be termed the class-name selector because it finds a single card by means of the general class or name under which it has been classified. This system, pictured in Figure 342, utilizes a steel filing drawer which has a capacity of 350 cards. The system is not confined to any certain size card, but made to accommodate cards 3 by 5 inches, 4 by 6 inches, 5 by 8 inches, and 6 by 9 inches in size. Two-drawer installations can be provided with a cabinet, which forms the unit. The drawer is equipped with keys which contain the classification under which records are to be found. Each card can be cross-filed or reached through several keys or classifications. This is accomplished at the time of filing the

¹Manufactured by such companies as Lederman System, Incorporated.

cards by placing small clips on the bottom of the card. One card may be filed under many classifications, by simply attaching additional filing clips. Attaching these little clips at the bottom of the card at the letters or figures where the card later is to be reached and then dropping the card in the drawer any place, front or back, completes the filing. The file clips are always in place directly above the rods of the key which raises them and prevents the card from being misfiled. Whenever a key is depressed, the attached rod comes in contact with each clip in that corresponding position. Thus all the cards of the predetermined classification are thrust up so that their edges appear above the remaining cards.

There are two rows of keys at the lower front of the drawer; these keys are not circular as on a typewriter, but are in the shape of a letter "U" and are open at the top to enable the user to insert letters or classifications to suit his particular need and also to permit highly specialized businesses or professions to use characters on the keys adapted to their needs. For example, the keys on a realtor's system may read "Business Property," "Farm Lands," "West Side Property," and so forth. Thus, this flexible keyboard enables the operator to segregate, classify, and

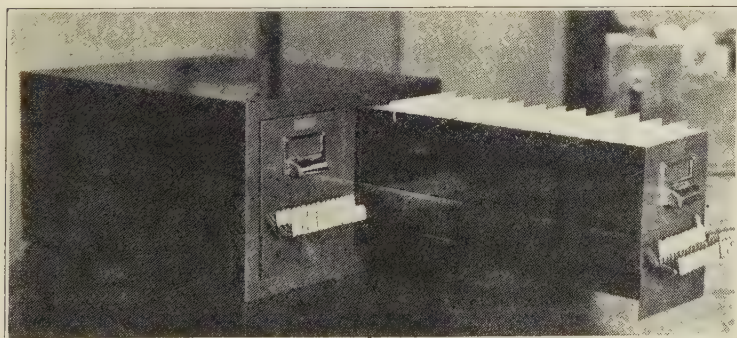


Figure 342: This device offers a means of selecting, finding, or filing one card or a group of cards at one time by a single key. The description of how this is accomplished starts on page 722.

highly specialize his records by very simple adjustments to the keyboard which are made by the operator at any time or place. The whole responsibility of correctly filing records consists in attaching a little clip to the card at the classification desired.

*Group Segregator.*¹ A third system of finding and filing, which is entirely different from the two previously described, may be termed a group segregator. This machine provides an automatic method of selecting records by cross-classification and presents them in groups without disturbing the filing order. Selections and segregations are made by multiple characteristics. The essential equipment of this system consists of a special file drawer called "selector," specially prepared cards, steel rods, and a slotting punch. The illustrations in Figure 343 show the equipment used by this system.

The basis of the system is the card (see Figure 344). The top of the card is designated to carry a brief summary of the record, or it can be extensive enough for a posting record. On the body or index part of the card are perforations. Two of these holes taken together in vertical relation constitute what is known as a "position." To each of these positions is assigned some one classification or characteristic. Each card is prepared for automatic selection by converting the two holes of significant positions into a slot by means of the hand-operated slotting punch.

When a selection is to be made, the cards, having been prepared, are placed in the selector whose front has a brass plate perforated to correspond to the card. Steel rods are then inserted in the positions which correspond to the classifications or factors involved in the selection at hand. If, for example, a selection is wanted on the basis of all New York customers, a rod would be inserted in, say, position 15. However, if the selection was to consist of all New York customers who had purchased during the year

¹Manufactured by such companies as The Findex Company.

1924, rods would be inserted both in positions 15 and 44. The more rods used, the finer will be the degree of selection.

After the rods have been inserted, the selector is inverted and all the cards which correspond will drop down half an inch by virtue of their having been slotted in particular positions which are involved. While the container is still inverted, a rod is inserted in the container to keep the cards in place (see Figure 345). The container is then set upright again and the desired cards are held up above the rest, ready for use. They can be inspected or tabulated without being removed. If, however, it is necessary to remove the card, an additional locking rod is inserted at the bottom and all the other rods are removed except these two locking rods; the cards are then perfectly accessible and still held up above the rest. By removing the locking rods all the cards drop back into place, thus avoiding the necessity of refiling.

The number of classifications possible is not limited to the number of positions available on the card, as by the use of codes or combination a remarkably large number of classifications are possible.

To summarize briefly, this system provides for the auto-

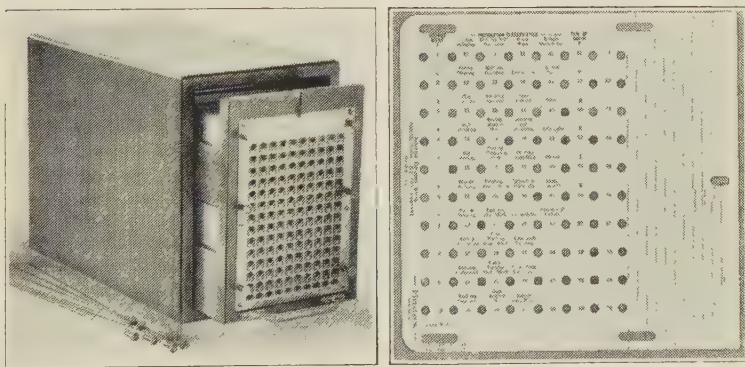


Figure 343: The three important units of group segregator system are illustrated here. The card shows how the information is classified. When a rod is placed in a perforation in the front of the file it makes it possible to select any classification of information. See page 724.

matic selection and segregation of cards according to any number of classifications. Only one card per record is necessary and no cross-reference files are required, as each user has his own card form especially designed for him.

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Fronts - Red Cards
Male - White Cards
Blue Cards - Positions

UNIVERSITY OF CALIFORNIA
Berkeley, California
Appointment Secretary

APPLICATION FILE

Figure 344: The basis of this system is the card. Note how the perforations are slotted. Each is termed a position and is assigned one classification. By means of the plate in the front of the device and a guide card, classifications may be determined. Figure 345 illustrates how the device is operated.

The file can be used for direct reference and posting at any time, and cards may be refiled automatically simply by removal of the locking rods.

This finding and filing system is an important aid to the keeping of sales records when used to classify customers and prospects by alphabetical arrangement, geographical location, branch office, salesman handling, class of trade, line of business products used or bought, credit rating, terms, and so forth. It is also well adapted to statistical, historical, and research records, as well as other numerous applications, such as new business, personnel records, stock control, and ledger records.

FINDING AND FILING PROBLEMS SOLVED

These devices present three different and distinct solutions of the difficult problems of finding and filing business data. Yet all three, although vastly different in construction,

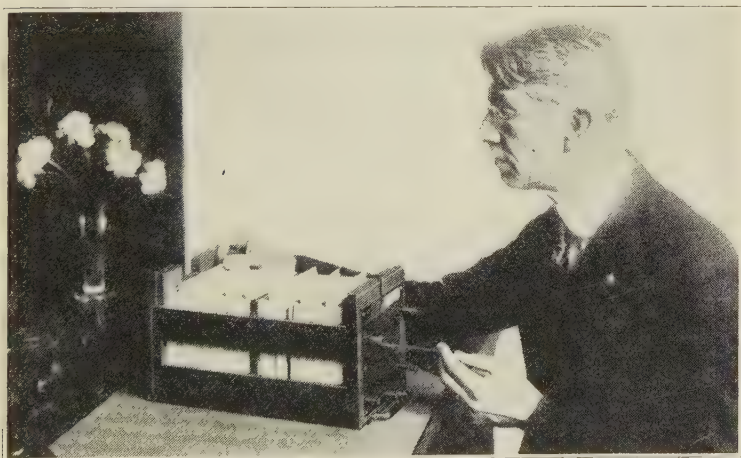


Figure 345: When a selection is to be made, a rod is inserted in the positions which correspond to the classifications involved in the selection. By inserting the device the cards which correspond drop. A rod inserted at the bottom of the container locks the cards in place. When upright the cards are ready for use. See pages 724 and 725.

operation, and even principles, make for greater efficiency. Each of these devices reduces supervising and provides for specialization and standardization of office detail. Each creates and insures a perfect organization of office records and an equal and constant distribution and control of records. Each eliminates the necessity of laboriously thumbing over the cards in the file and selecting in that manner those that meet requirements of classifications or segregations. Each is an important time- and labor-saving device.

XXXVII

OFFICE FURNITURE

Why your office should be comfortable and attractive. Desks: roll-top desks; flat-top desks; typewriter desks. Chairs. Tables. Bookcases. Lockers. Miscellaneous equipment: typewriter stands; desk tops or pads; inkwells; desk trays; moisteners or sponge cups; lighting fixtures; pencil sharpeners. Proper furniture increases efficiency.

THE average business man spends one-third of the best years of his life within the walls of an office building, and yet only during the present generation has an attempt been made to incorporate in the equipment of an office any of the features of comfort and appearance that go to make the "Home Beautiful." Up to only a few years ago office furniture was considered as nothing more than "just a desk and some chairs." Today, however, the modern office—not only the executive's sanctum, but the entire office—is equipped attractively with comfortable, matched furniture.

Executives realize that unless their employees have proper working conditions they cannot get out work which will reach the desired quality or quantity standard; fatigue always means increased production costs, increased labor turnover, and decreased quantity. No business man can afford to ignore these facts. It has been stated that in practically all factories or offices as high as 50% of the losses through fatigue are preventable, because more fatigue results from improper working conditions than from the actual work performed.

Recognizing these pertinent facts, manufacturers have developed many distinctive lines which add much to the comfort of the present-day office worker and bring a decided attractiveness to the most prosaic work-room. In fact, beauty of line and quality of material and finish lend dis-

tion to the office. The many styles, ranging from the period designs to the square angle type, allow for an expression of individuality. Figure 346 illustrates a private office which is beautifully furnished with matched furniture.

The subject of office furniture is broad and in the following paragraphs no definite endeavor has been made to include all those types of office furniture which can be found in use today. The basis of classification, therefore, has been according to the various items of equipment most commonly used.



Figure 346: The kind of office furniture used may determine to a large extent the percentage of work performed daily. The private office illustrated here shows how comfort and beauty can be combined. Notice how complete this modern office is in all its details.

OFFICE DESKS¹

The various needs of business are responsible for the development of three kinds of desks: the roll-top, the flat-top, and the typewriter desk. Practically all manufacturers of office desks put on the market these three kinds, either in wood or steel. In general the wood and steel desks are constructed upon the same principle; however, the steel desks are uniformly furnished with tops or writing beds of various materials and covered with linoleum. Some manufacturers of the wooden desks also furnish tops covered with this material.

The steel desks may be finished in any style to match any of the wooden furniture which may be used. Both of the wooden and steel desks are so constructed that they stand high from the floor, making it possible to keep the floor under and around the desk in a sanitary and neat condition.

Roll-Top Desks. The cabinet-like file or pigeon-hole container built upon the writing surface of the roll-top desk

¹Desks of practically every kind are manufactured by such companies as American Desk and Stool Company; American Desk Company; Art Metal Construction Company; Atlanta Table Company; Automatic File and Index Company; Bentley and Gerwig Furniture Company; Brown-Morse Company; Buffalo Desk and Table Company; Byron Desk Company; The Canton Art Metal Company; Central Manufacturing Company; The Clemetsen Company; Commercial Furniture Company; Cutler Desk Company; J. F. Dietz Company; Doten-Dunton Desk Company; Durand Desk Company; O. M. Edwards Company; Englewood Desk Company; Evansville Desk Company; Excello Products Corporation; Franklin Manufacturing Company; General Fireproofing Company; The Globe-Wernicke Company; The Gunn Furniture Company; Hoosier Desk Company; Horrocks Desk Company; Imperial Desk Company; The Jasper Desk Company; Jasper Novelty Company; Jasper Office Furniture Company; Leopold Desk Company; The Macey Company; Marysville Cabinet Company; Metal Office Furniture Company; Minneapolis Office and School Furniture Company; Montgomery Table and Desk Works; Myrtle Desk Company; National Desk Company; O. C. S. Olsen Company; Orpin Desk Company; The Quigley Furniture Company; Rand Kardex Bureau; Shaw-Walker Company; Shelbyville Desk Company; Smith Wayne Company, Incorporated; Southern Desk and Table Company; Standard Furniture Company; Steel Equipment Corporation; The Steel Fixtures Manufacturing Company; Stow and Davis Furniture Company; Tell City Desk Company; Valley City Desk Company; Van Dorn Iron Works Company; Wagemaker Company; Watson Manufacturing Company; Western Furniture Company; Yawman and Erbe Manufacturing Company.

offers to the user of this kind of desk a means of filing papers which are in constant use or frequently referred to. The cover, which rolls back of the file or which may be locked over the writing surface of the desk, affords security. The illustration in Figure 347 shows one style of roll-top desk.

There was a time when the roll-top desk, with its many pigeon-holes, reigned supreme. It is still used to advantage in certain classes of work and for certain purposes, but generally speaking it has given way to the flat-top desk. However, practically all companies which manufacture desks continue to make roll-top desks, for, although pigeon-holed desks have been rendered somewhat obsolete by the development of the modern filing system, there are many business men who prefer the roll-top desks, because when suddenly called away they may close the top, thus hiding from view, and at the same time securing the safety of, any papers

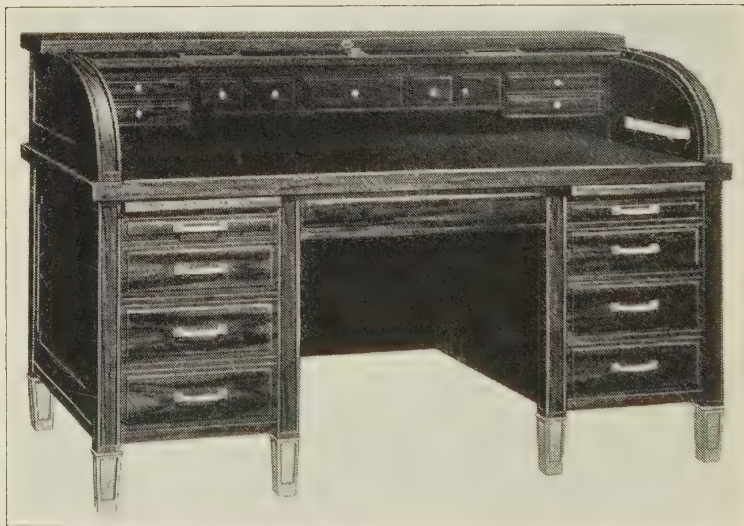


Figure 347: This roll-top desk has small drawers above the working surface for data and working tools which are in constant use. The cover which rolls down over the top of the desk permits the owner to lock up his desk at any time that he may be called away from his work. This style desk is constructed in wood or steel.

upon which they may have been working. With this idea in view a low roll-top model¹ has been developed which has a top 8½ to 13 inches high from the writing bed, and which is placed on a regular flat-top base.

Flat-Top Desks. Constructed with a table-like writing surface, the flat-top desk affords the maximum working and writing space. It is usually supplied with six drawers—three on one side of the desk, two on the other, and one in the center, so designed as to give proper knee space. The interior of the drawers is equipped with partitions for the filing² of papers of all sizes, and for other desk supplies. Many manufacturers offer a variety of drawer combinations to suit the convenience of the user. The drawers of one kind of desk are equipped with roller slides, and thus can be operated and closed with the greatest ease and may be pulled out their entire length without falling to the floor. Figure 348 shows two of the many flat-top desks.

Typewriter Desks. The typewriter desk has been especially designed and developed to provide for the needs of the secretary or stenographer just as the roll- and flat-top desks are essentially intended to serve the executive. With the needs of the stenographer clearly in mind, manufacturers have perfected three different styles of typewriter desks, each with distinctive features. One type is the drop-center model, which provides for the typewriter in the top of the desk, folding it into a compartment when the machine is not in use. A second type provides a sliding tray or platform—upon which the machine may be attached at right angles to the desk—and a mechanism which allows the machine to drop and slide into a compartment. A third type provides for the typewriter, but does not furnish a mechanism or

¹Manufactured by practically all manufacturers of desks.

²File desks which are built for filing are manufactured by the makers of desks and file cabinets. As these desks function chiefly as file cabinets with a working surface, they will be described in detail in the chapter on Filing Equipment.

compartment to house the machine. The illustrations in Figure 349 picture two of these models.

The first type described, the drop-center model, may be built in two styles—one the vertical stationary drawer, the

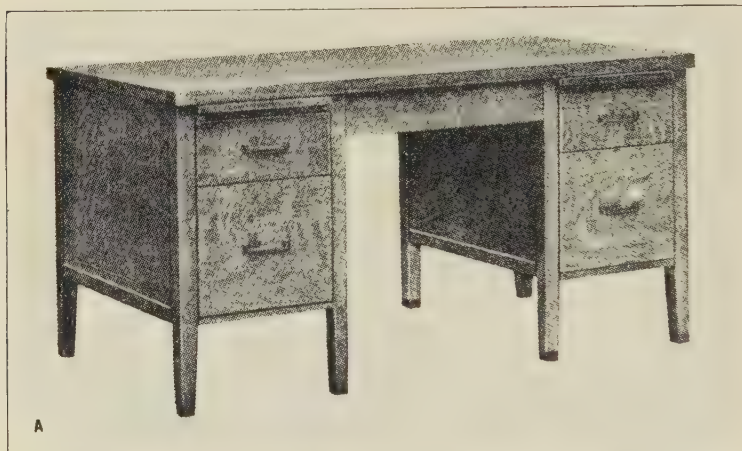


Figure 348: A flat-top desk affords the maximum working and writing surface. The drawers of desks such as the one shown in illustration A may be equipped, for efficient handling of material, with adjustable partitions, card drawers, and sliding tool trays. Note that the desk in illustration B is designed to match a complete suite of furniture.

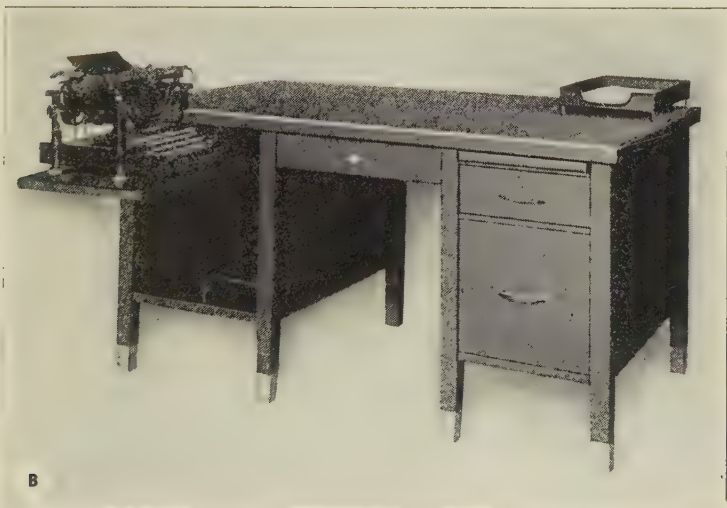


Figure 349: Here are two styles of typewriter desks. Illustration A represents the center drop style, which holds the typewriter on a folding platform. Illustration B pictures the side compartment desk which affords the user an entire desk working surface and at the same time the use of the typewriter. Read how the typewriters are housed in these desks—pages 733 to 737.



Figure 350: Here a center drop typewriter desk with special features is illustrated. Note how the special features assist the typist in handling work in a time-saving and efficient manner. When the desk is closed, the top affords a flat-top desk. For a detailed description, see page 737.

other the parallel stationary drawer, with an identical principle of operation in each case. When the desk is closed, the typewriter is folded into the compartment in a slanting position, hence transforming the typewriter desk into an ordinary flat-top desk with an unbroken working surface.

There is, however, another style¹ of this same type which permits the typewriter to remain in a horizontal position when the desk is closed. The desk is easily opened. A handle in the position similar to the "center-drawer" handle of any desk is lifted, the center top is pushed down, and the leaf upon which the typewriter is attached raised into place—that is, at the level of about six inches below the desk

¹Manufactured by such companies as The Macey Company.

top. This places the machine in a proper position for the operator and also leaves that portion of the desk top not occupied by the typewriter free for notes and other material (see illustration A of Figure 349).

There are other models of typewriter desks, such as a drop-center type with special features.¹ On both sides of the top, which stands about 10 or 12 inches at the back of the desk, there are handy pockets, or receptacles, for such supplies as telegrams, envelopes, and pads. In the center of the top there is attached an adjustable copy-holder. The drawers on each side of the typewriter are similar to those of the standard drop-center desks; however, the lower right-hand drawer is arranged into six handy compartments for all sizes and kinds of forms. When the dictation shelf is pulled out for use, it exposes the top drawer, and thus the stationery kept in that drawer is accessible at all times. When closed, the so-called "secretary" becomes a standard-size desk (see Figure 350).

The second type of typewriter desk, shown in illustration B of Figure 349, affords the operator an entire desk and at the same time the use of the typewriter. This style is especially valuable to those who do more desk work than typing. Since the machine is at right angles to the desk, the operator may easily swing around from the machine to the desk without moving from the chair. When the machine is not in use, the platform-like leaf swings down and slides into the cupboard-like compartment. The door of the compartment is made to resemble the drawers on the other side so that when it is closed it gives a balanced appearance.

The third kind of typewriter desk is built with vertical drawers or parallel drawers. Both styles might more properly be classified as flat-top desks, since there is no means of housing the typewriter. However, there is ample drawer space especially arranged for the comfort of the typist.

¹Manufactured by such companies as Byron Desk Company and Imperial Desk Company.

OFFICE CHAIRS¹

The problems resulting from the modern emphasis on the need of proper seating in offices have been solved in the characteristic modern way—by specification. In the past, chairs for home and office use were made in one factory; now large factories are exclusively devoted to the manufacture of chairs for business and professional use (see Figure 351).

Office chairs, like office desks, are either of wood or steel. They are now manufactured in numerous styles which include the steel furniture and the richly carved woods in popular period furniture. It becomes merely a matter of choice,

¹Manufactured by such companies as Allen Chair Company; A. H. Andrews Company; Angle Steel Stool Company; Art Metal Construction Company; Astra Bent Wood Furniture Company; S. Bent and Brothers; Bodenstein and Kuemmerle; Brown-Morse Manufacturing Company; Buffalo Metal Furniture Manufacturing Company; Canton Art Metal Company; Chicago Wire Chair Company; A. Claus Manufacturing Company; Cleveland Fixture Company; Cleveland Seating Company; H. Closterman; Colonial Chair Company; Columbus Aseptic Furniture Company; Conrades Manufacturing Company; C. A. Cook Company; Cook Furniture and Equipment Company; Crocker Chair Company; Crown Chair Company; Culler Furniture Company; Cutler Desk Company; Davis Chair Company; W. DeFrehn and Sons; Delaware Chair Company; C. Derby and Company; Domore Chair Company; Duane Chair Company; John A. Dunn Company; Robert J. Ehlers Company; Fort Smith Chair Company; Globe-Wernicke Company; Grand Ledge Chair Company; W. H. Gunlocke Chair Company; Hale Company; Hartwig and Kemper; Harvey Chair Company; Herhold Chair Company; Heywood-Wakefield Company; Horrocks Desk Company; Jasper Chair Company; Johnson Chair Company; Kalamazoo Steel Goods Company; S. Karpen and Brothers; Kohn, Jacob and Josef; Langslow Fowler Company; Logeman Manufacturing Company; The Macey Company; Manufacturing Equipment and Engineering Company; B. L. Marble Chair Company; Marble and Shattuck Chair Company; Marietta Chair Company; John Miller and Company; Milwaukee Chair Company; Murphy Chair Company, Incorporated; Nichols and Stone; H. L. Noecker and Son; Northwestern Furniture Company; L. W. Ott Manufacturing Company; Phoenix Chair Company; S. K. Pierce and Son Company; Poughkeepsie Chair Company; Renfro-Wodenstein Desk Company; Retting Furniture Company; Rossell Brothers and Company; Royal Metal Manufacturing Company; Sheboygan Chair Company; The Sikes Company; Sikes Consolidated Chair Company; Southern Chair Company; Standard School Equipment Company; Stow and Davis Furniture Company; Suitt Brothers Manufacturing Company; Superior Furniture Company; Temple-Stuart Company; Thonet Brothers; Tonk Manufacturing Company; Union City Chair Company; Van Meter Chair Company; Wagemaker Company; Webster Manufacturing Company; W. M. Welch Scientific Company.

but it seems in general that the office furniture, in so far as it is possible to do so, is being matched up not merely in the private office, but "outside" as well.

The designing of chairs especially to meet the physical requirements of the particular kind of work that is to be done when the chair is in use, has produced some interesting results. Figure 352 shows an office chair with adjustable seat and back to suit the individual requirements of workers. The swivel chair which has a maximum adjustment of four inches offers a high degree of comfort. The seats of all the styles of chairs are formed of flexible steel frames supporting a wood seat, some of them being padded and upholstered in leather. They are shaped to conform to the body and are deep enough to distribute the weight comfortably and properly. The open space between the seat and the back-rest permits the occupant to sit into the chair comfortably. The



Figure 351: Here are two styles of revolving chairs which illustrate how they may differ in design. Chairs are made in many styles. Read the description on page 738.



Figure 352: Here is a chair which is designed with special attention to physical requirements. It is adjustable to four heights to suit individual requirements. The back-rest is also adjustable laterally and vertically. Higher chairs of this same construction are built especially for factory work. See page 737.

back-rest is adjustable both laterally and vertically, and automatically swivels to fit into the hollow of the back.

By concentrating their efforts on the needs of modern business, manufacturers are constantly developing new designs



Figure 353: Tables can be used in practically every department. Small tables as well as large fulfil an important need in the office. The two illustrations above show two ways in which tables may be used. Note the difference in sizes.

appropriate to the various requirements of all types of industry.

OFFICE TABLES¹

A piece of furniture which has, perhaps, the most varied use in the office is the table. So common is it that there is little need for describing it in detail. There are, however, styles of tables are so numerous that it would be difficult to several points which should be considered. It has been noted that desks and chairs are made in wood and steel. Tables are also constructed of these two materials. The enumerate them. They are made in varying sizes—lengths and widths—as well as in varying designs. The plain and unadorned table with a small center drawer is perhaps the one which is most often used; however, the large, heavy table, or the finely carved table which matches the desk, chair, and other office furniture is often used in the private office. Most executives find the arrangement shown in Figure 346, or a similar plan, ideal. That is, the use of the table with the desk gives the executive two working surfaces. Often another table, a small one, is used in the same private office. Outside of the private office the table is used for many purposes. Figure 353 shows two of the ways in which the plain wooden tables may be used. Note that six persons can work at the table pictured in illustration A. Tables such as those shown in illustration B can be used for numerous purposes. Very often they are used for figure machine work as illustrated.

¹Manufactured by such companies as Art Metal Construction Company; Browne-Morse Company; Byron Desk Company; Central Manufacturing Company; Clemetsen Company; Commercial Furniture Company; Cutler Desk Company; Englewood Desk Company; The General Fireproofing Company; The Globe-Wernicke Company; The Gunn Furniture Company; Hoosier Desk Company; Lyon Metallic Manufacturing Company; The Macey Company; Metal Office Furniture Company; O. C. S. Olsen Company; Orpin Desk Company; Quigley Furniture Company; Rand Kardex Bureau; Shelbyville Desk Company; Southern Desk and Table Company; Steel Equipment Corporation; Steel Fixtures Manufacturing Company; Stow and Davis Furniture Company; Watson Manufacturing Company; Yawman and Erbe Manufacturing Company.

OFFICE BOOKCASES¹

With the growing importance of business libraries there has come a corresponding development in the office bookcase. Every well-equipped business office today has, in its equipment of office furniture, a bookcase. The majority of these cases are in sectional style, so that it is possible to start with a few books and let the bookcase grow with the library. One may choose either a wood or a steel case.

There is a wide variety of sizes, and they may be equipped with either sliding or swinging doors. The sectional wooden bookcases have been developed in any number of designs to match entire office suites and are finished in oak or mahogany. The illustration in Figure 354 on the next page show two models.

Illustration A represents the sectional bookcase which allows for a growing library. Illustration B presents a bookcase of period design; it adds considerably to the attractiveness of a matched suite.

OFFICE LOCKERS²

Lockers are now being recognized as a necessary part of the well-equipped office, not only because they provide a convenient and safe place for the storage of wraps and personal property, but because they tend to raise the morale of the employee.

There are three types of lockers for office use: single-tier, double-tier, and compartment locker. Where conservation of space is not essential, the single-tier locker is desirable, as

¹Manufactured by such companies as Art Metal Construction Company; The General Fireproofing Company; The Globe-Wernicke Company; The Gunn Furniture Company; The Macey Company; Quigley Furniture Company; Rand Kardex Bureau; Shaw-Walker Company; Steel Equipment Corporation; Weis Manufacturing Company; Yawman and Erbe Manufacturing Company.

²Manufactured by such companies as All-Steel-Equip Company; The General Fireproofing Company; The Hart & Hutchinson Company; Lyon Metallic Manufacturing Company; Manufacturing Equipment and Engineering Company; Terrell's Equipment Company.

it has a full-length compartment which affords ample room for coat, hat, and shoes. The double-tier locker has no hat shelf and necessitates folding long coats; however, it effects a considerable economy in space. The compartment lockers combine locked compartments for personal belongings with a large compartment for coats and umbrellas. Figure 355 illustrates the single-tier and the double-tier types of locker.

Lockers are now being constructed with special attention to the door and the door frame, as it is this feature which determines the security of the locker. The doors are reenforced in such a way that they are stiff and rigid; the corners are welded to eliminate all sharp edges and the locks are secured by positive locking mechanisms.

There are many features which are incorporated into the lockers of different makes. There are now on the market



Figure 354: The well-equipped business office today has in its equipment a bookcase. Bookcases are constructed in two styles: the one-piece or the sectional. Illustration A represents the sectional bookcase which provides for a growing library. Illustration B shows a one-piece bookcase which is designed to match the office suite.

single-tier lockers which double the floor-space capacity in that each compartment is divided in two parts. Thus, the upper box compartment and left-hand compartment are for the use of one person; the lower box compartment and the right-hand compartment for another person.

Another feature is an extra shelf and a rearrangement of hooks by means of which a single locker can be made to serve two people. This arrangement gives hanging space for long coats with the floor-space economy of the double-tier locker.

All of these steel lockers are so constructed that they have sufficient strength and rigidity to withstand wear, doors which work with ease, locks which protect the contents, and ventilation which is adequate.

MISCELLANEOUS OFFICE EQUIPMENT

The well-furnished business office today must be completely equipped with all the minor items of office furniture as well as those of importance, such as desks, tables, chairs, or bookcases. These smaller items of equipment include typewriter stands, desk pads, waste-paper baskets, and proper lighting fixtures.

*Typewriter Stands.*¹ One popular style is the stand which has folding levers at the sides, thus affording a writing surface or copy-holder on each side of the typewriter. A swinging stand² which can be attached to any ordinary desk provides space for the typewriter and is also very convenient. The stands can be swung into any position and locked by an arrangement which is actuated by a thumb-screw. Iron-frame connecting rods in conjunction with the locking device make the stand firm and rigid.

¹Practically all manufacturers of typewriter desks also manufacture typewriter stands.

²Manufactured by such companies as Weis Manufacturing Company; Yawman & Erbe Manufacturing Company.

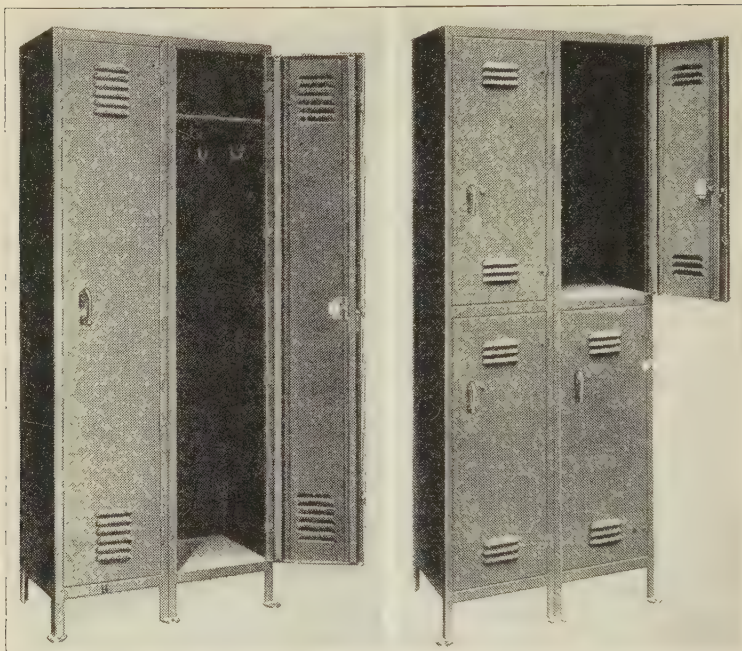


Figure 355: Office lockers are a necessity for every office, as they provide a convenient and safe place for the storage of wraps and personal property. The illustration above shows two types of lockers—the single-tier and the double-tier. Read pages 743 to 745 for a description of the various types of office lockers.

*Desk Tops or Pads.*¹ Some manufacturers have developed special tops or pads which are part of the desks. One company has developed a complete line of desks and tables with tops which are formed of a specially prepared fabric inlaid in a wooden case with moisture-proof joints and rounded edges.² The fabric, which is the outcome of scientific research, is resistant to stains and wear. Desk tops of this kind eliminate harmful light reflections and thus, by re-

¹Manufactured by such companies as Art Metal Construction Company; The Globe-Wernicke Company; The Macey Company; Wagemaker Company; Yawman and Erbe Manufacturing Company.

²Manufactured by such companies as Central Manufacturing Company; and The Gunn Furniture Company.

lieving eye-strain, add measurably to office efficiency. In some cases the desk top or pad is a separate and complete desk fixture. The pad, which is composed of two specially prepared pieces of linoleum¹ cemented together back to back, gives a finished surface on both sides with fabric in the center. This construction gives equal resistance both ways and holds the pad flat at all times so that it cannot warp or buckle. This pad also eliminates light reflections, protects the desk top, and adds to the general appearance of the desk.

The pad which is covered by glass² affords a memo file that is visible at all times. The holder is made of green leatherette and is semiflexible. The underside is covered with felt, and at the back edge of the holder are two raised leather corners which hold the glass in place when raised or in position. The glass extends to the edge of the pad and is plain-finished or beveled. This pad protects the desk surface and is easily kept free from dirt and stains. .

Plate glass alone with beveled edges is often used as a desk cover. While it is furnished special to order only, it can be supplied in any size. The glass is approximately a quarter of an inch thick and both sides of the surface are highly polished. Edges are usually square-ground and polished, but where such is required a bevel of half an inch or three-quarters of an inch wide can be provided on all four edges of the glass. The plate-glass top is intended to cover the entire writing surface of the desk and may be clamped on the edges of the desk top.

*Inkwells.*³ There is on the market an inkstand that automatically closes, thus eliminating dirt and evaporation. When the pen is dipped into the opening of the inkstand it presses down the float, thus causing the ink to overflow on to the pen. The hard-rubber float is enclosed in a hard-

¹Manufactured by such companies as Wagemaker Company.

²Manufactured by such companies as The Chicago Mirror and Art Glass Company.

³Manufactured by such companies as Bachrach Specialty Company; Sengbusch Self-Closing Inkstand Company.

rubber casing, commonly termed the "fountain." This fountain is set into the glass and the top screws onto the top of the glass. A self-acting glass valve below the float holds all sediment in the bottom of the inkstand, making cleaning necessary only once or twice a year. This inkstand eliminates dirt in the ink, evaporation of ink, and overloading the pens; it saves the time and the ink wasted in frequent filling and cleaning. It is made in double or single styles and in various sizes.

Desk Trays. The desk tray renders a service of great value to the business man in carefully retaining letters and other important papers. Desk trays are made in three popular styles: the vertical, the single flat, and the tier tray. Each of these styles may be fashioned of various materials. A detailed description of each type is given below.

The vertical tray¹ resembles a file in that it is constructed in vertical compartments and may be assembled in as many sections as desired, from one-inch capacity to ten inches, with high or low partitions—vertical or horizontal—as desired. This file may readily be adapted to many purposes; it may be used for holding the telephone directory and other books frequently wanted, or as a distributor at the filing desk, a mail sorter at the mailing desk, a permanent classification and reference file, and so forth.

The flat trays² are made in many different styles in wood, wire, steel, and glass, in single and double tiers, one upon another. A great number of companies make these trays in all styles to match furniture and in all sizes to accommodate special needs of business.

¹Manufactured by such companies as Sengbusch Self-Closing Inkstand Company.

²Manufactured by such companies as American Electric Company; Art Metal Construction Company; Browne-Morse Company; Commercial Furniture Company; The General Fireproofing Company; The Globe-Wernicke Company; The Macey Company; Manufacturing Equipment and Engineering Company; Orpin Company; Rand Kardex Bureau; Shaw-Walker Company; The Sikes Company; Steel Equipment Corporation; Stow and Davis Furniture Company; Wagemaker Company; Watson Manufacturing Company; Weis Manufacturing Company; Yawman and Erbe Manufacturing Company.

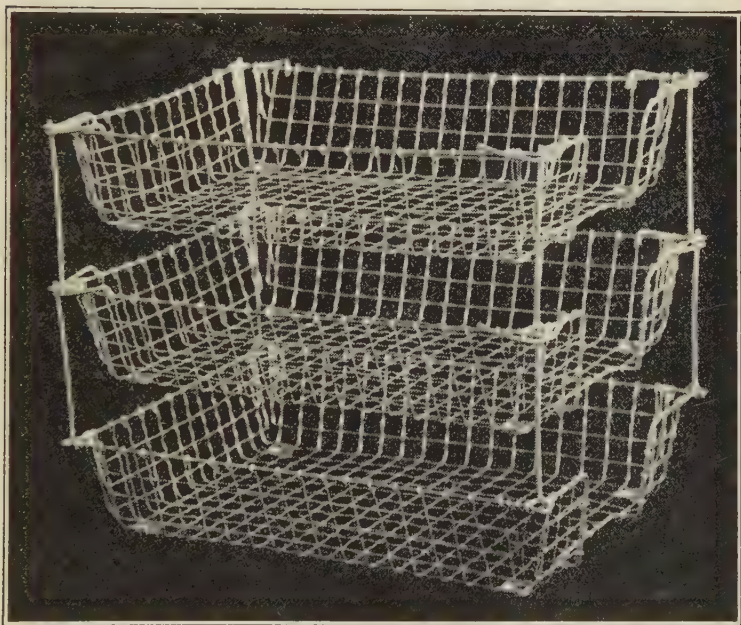
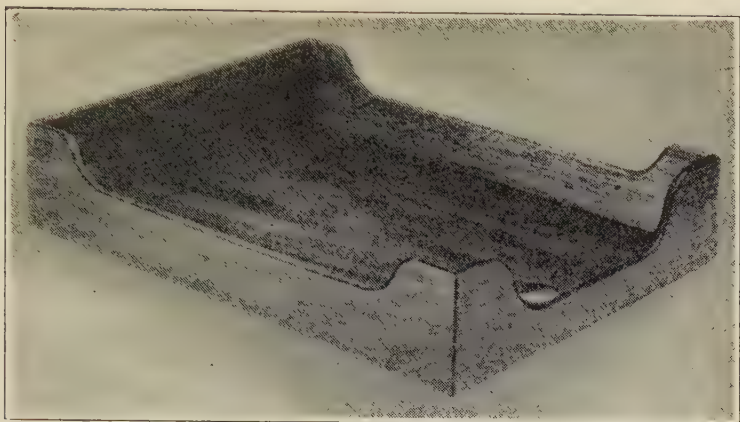


Figure 356: The desk tray renders valuable service to the business man in carefully retaining letters and other important papers. The flat trays are made in wood, steel, wire, and glass; in single and in double or triple tiers. Here the wooden single flat tray and the wire triple tier tray are pictured. Note how the wire tray is built up by means of wires which clamp the trays at the corners.

Those made of wire mesh¹ may be used as a single basket or may be built up as high as desired and are easily put together, by means of clamps which are supplied with each basket (see Figure 356). The standard size is 14 by 10 by 3 inches, but they are made larger or smaller, according to need.

The glass trays² are held together securely by nickel-plated clamps, tipped with rubber. They are especially sanitary, as they may be easily kept clean by washing.

*Moistener or Sponge Cup.*³ Another item of every-day use in practically every modern office is the moistener or sponge cup. Where stamps, labels, or envelopes are to be moistened, the porcelain wheel revolving in water is the most sanitary and efficient moistener. One company manufactures a moistener the barrel of which revolves on a nickel-plated pin and permits it to turn freely, carrying plenty of water around and making no noise. This type of moistener has nothing to wear out, nor does it become gummy or sticky.

To prevent the inconvenience caused in using a sponge cup when the sponge cup overflows, the sponge has been placed in an inner wall surrounded by a trough or channel into which the overflow runs, returning to the main well through an opening, with no danger of reaching the desk or papers.

*Lighting Fixtures.*⁴ In equipping an office, careful attention should be given to the lighting system. Although the entire office lighting system cannot be taken up here, the means of desk lighting can be described, as there are numerous lamps on the market which are made primarily for office

¹Manufactured by such companies as Andrews Denison; Barbee Wire and Iron Works; The Washburn Company.

²Manufactured by such companies as The Chicago and Art Glass Company.

³Manufactured by such companies as Sengbusch Self-Closing Inkstand Company.

⁴Manufactured by such companies as Aladdin Manufacturing Company; American Electric Company; Faries Manufacturing Company; H. G. McFaddin and Company; and Peerless Light Company.

use with many special features, such as weighted base with flexible adjustable arms, and adjustable shades. Many interesting models in lighting fixtures have been developed; one which has an adjustable and detachable glass shade, the feature of which is the holder which permits the shade to be taken off or replaced without disturbing the electric wiring.

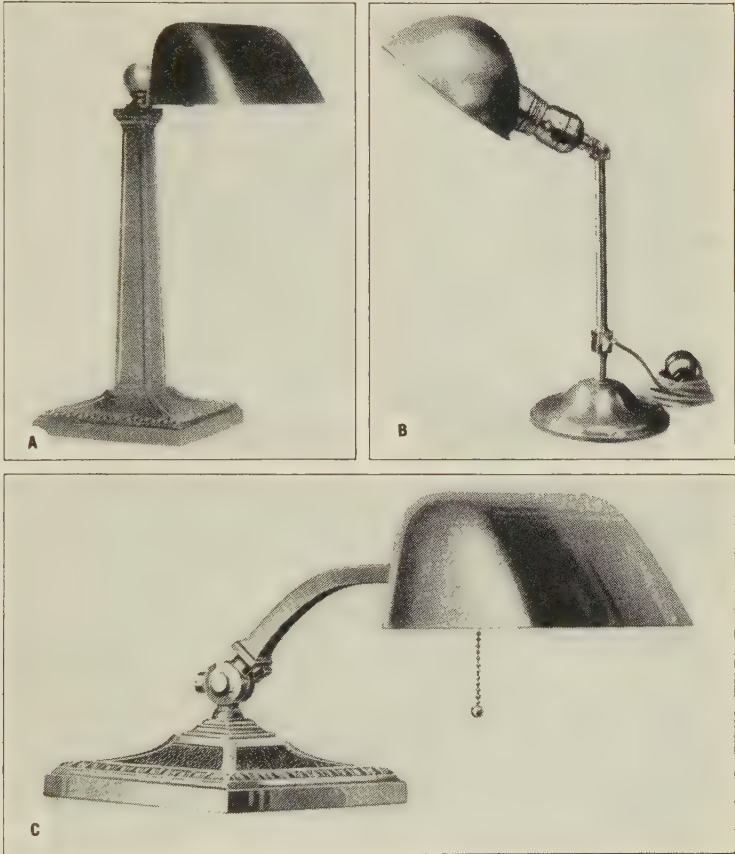


Figure 357: Each of these three desk lamps has special features. The one in illustration A is designed for a flat-top desk; that in illustration B may be used on either a flat- or roll-top desk, due to its adjustable features; and that in illustration C is specially designed for a roll-top desk.

For a detailed description of desk lamps, see pages 750 to 752.

These shades are made of green glass with opal reflecting surface inside. The outside shades the eyes and the inside reflects the light directly upon the work. The arm and shade of the lamp, which is specially designed for the roll-top desk, can be adjusted vertically. Lamps have also been produced specially designed for use on roll-top and flat-top desks, tables, mailing desks, file cases, adding and bookkeeping machines, and typewriter desks, and metal floor lamps to meet office needs.

Another model of a floor lamp which is especially convenient for office use can be placed between two desks where a desk surface is entirely utilized, and when a light is desired in various positions. All of these office lamps are finished in many designs. Figure 357 pictures three of these lighting devices.

Since the question of wiring enters into this problem of office lighting, it may be mentioned here that plug clusters afford a way of making a greater number of connections at one time out of one socket.

*Pencil Sharpeners.*¹ Every modern office is supplied with pencil sharpeners, and hence these devices are too common to necessitate description in detail. However, a general description of the pencil sharpener may be given here. The working principle of the pencil sharpener is the cutting gear which is adjusted at the proper angle to secure the desired pencil point, and which may be easily removed and renewed. The pencil is sharpened by placing it in the opening and turning the handle. The shavings fall into a receptacle which may be removed and emptied.

There are several other items which go to make an office complete, but which, because of limited space, cannot be described in this book. These articles are important in themselves for the purpose they fulfil, but to give a complete list of office furniture and accessories is an impossible task; it is necessary to pass over, with only a word, certain products

¹Manufactured by such companies as Automatic Pencil Sharpener Company; Graff-Underwood Company.

such as: office trucks,¹ floor covers,² adjustable office partitions,³ and office blackboards.⁴

PROPER FURNITURE INCREASES EFFICIENCY

There is no doubt that modern office furniture is daily playing a most important role in the commercial world. Business men are realizing more and more that careful attention to the kind of desks and chairs their employees occupy daily has a direct effect upon the type of work which they do. With this realization there has come a higher standard in office furniture; manufacturers have placed upon the market furniture which tends to lessen fatigue and add to office efficiency. This movement to "beautify the office" as well as make it a place of comfort for its workers is a most important development in the history of modern business in America.

¹Manufactured by such companies as Nutting Truck Company; Angle Steel Stool Company.

²Manufactured by such companies as Armstrong Cork Company; Bird and Son, Inc.; and The George W. Blabon Company.

³Manufactured by such companies as Art Metal Construction Co., Circle A Products Corporation; Improved Office Partition Company; The Sanymetal Products Company.

⁴Manufactured by such companies as Caxton School Supply Company.

XXXVIII

LOOSE-LEAF ACCOUNTING RECORDS, EQUIPMENT, AND SYSTEMS

The evolution of loose-leaf accounting records. From bound ledger to loose-leaf: bound-book ledgers; the first Boston ledger; card ledgers; loose-leaf ledgers. The first practical loose-leaf ledger. Importance of the loose-leaf idea to present-day business. Advantages of loose-leaf systems. Loose-leaf equipment. Binders: solid-post; sectional-post; chain-post; tubular-post; thong; telescoping-back; fixed-capacity; ring and prong. Paper. Loose-leaf systems. Loose-leaf indexing: numerical; alphabetic; geographical; indexing by route; subject filing; division leaves and tabs.

ACCOUNTING or bookkeeping records, in one form or another, have existed perhaps ever since man began the exchange of commodities on a credit basis. When business was a less complex affair than it is today, the shortcomings of the now antiquated records and methods of bookkeeping were not so serious a handicap to commerce as they would be at the present time. Today, accurate and convenient records are the very foundation of our great commercial structure.

The evolution of equipment for modern record-keeping offers as romantic a story as may be found in the history of commercial enterprise. Though little is known of the origin of bookkeeping, Babylonian records have been found dating back to 2600 B.C., written with a stylus on small slabs of clay. The accounts of the Egyptians were penned on papyrus, one of the earliest forms of paper, believed to have been in use as a writing material as early as 4000 B.C.

In the second century B.C., a scarcity of papyrus led Eumenes II, King of Pergamus, to develop what finally came to be known as parchment, made from skins of sheep and calves. The supremacy of parchment as a writing material persisted until a time in the tenth century when paper began

to overshadow it. Although the art of making paper from fibrous matter appears to have been practiced by the Chinese at a very early period, it was not until the eighth century that paper became available to the rest of the world.

Paper mills were established in Europe in the twelfth century, but the use of paper did not increase very rapidly until following the invention of printing. The ease with which paper could be worked on a press, and its greater economy, soon brought it to almost universal use.

As early as 2400 B.C., in Babylonia, legal decisions, reve-

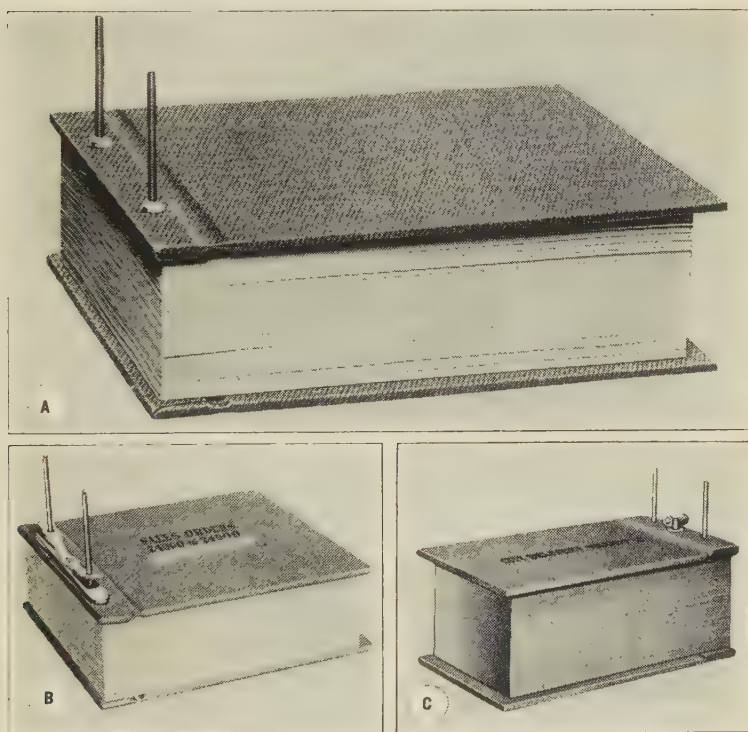


Figure 358: The solid-post binders above picture the two principal styles. Illustration A is the threaded type, which is used chiefly for storage purposes. Note the nuts which screw down over the posts to give the desired capacity. Illustrations B and C are of the smooth, solid-post type, which is desirable for current accumulation. Compare the locking devices.

nue accounts, and so forth, were inscribed in cuneiform characters on clay tablets and placed in jars to *preserve* them for reference. A clay tablet attached by straws served as a label to indicate the contents of each jar.

With the advent of the flexible papyrus came some dis-

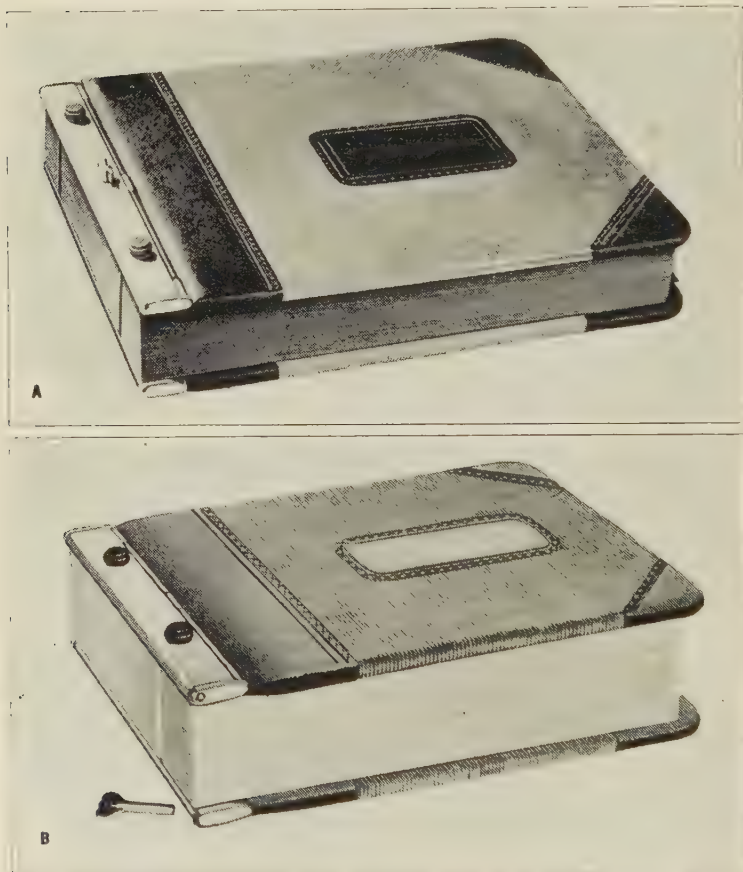


Figure 359: Here the sectional-post binders are pictured. Illustration A represents the top-lock style, illustration B the end-lock. In each case the smooth steel posts screw together and into base sections firmly attached to the bottom bar. This gives any desired amount of expansion for removal and insertion of leaves. For further details, see page 774.

tinctly forward steps in filing methods, in so far as a reduction in bulk is concerned: (1) the volume or roll, wound round a stick and encased in hollow cylinders; (2) protective covers which later led to bound books of various types.

In the third or fourth century B.C., wooden tablets, waxed to within one-half inch of the edge, were used in place of parchment or papyrus. On this waxed surface, all sorts of data were inscribed with a pointed stylus. When the matter became obsolete, the blunt end of the stylus was used to erase the writing by the simple process of smoothing the wax. Thus, the user was thereby enabled to write again upon the new surface. The waxed surface was sunk about one-sixteenth of an inch below the edges. On the unwaxed edge round holes were provided for binding the different tablets in book form. The two outer tablets were waxed only on the inner side. Copies of these crude bound loose-leaf records are on display in the British Museum. So far as available records go, these early volumes indicate that the loose-leaf book of a kind was used prior to the sewed or bound book, and some 2,000 years before commercial loose-leaf systems were made available.

The next earliest known method of fastening together the leaves of a book consisted of lacing with cord or fiber run through holes stabbed right through the substance of the sheets near the edge. This stabbed form of binding was perhaps the first attempt to assemble the consecutive pages of a record into reference form. The method of folding vellum into pages and of stitching them together through the fold at the back, round a strong strip of leather, dates back to the fifth century.

FROM BOUND LEDGER TO LOOSE-LEAF

To keep pace with the changing formulas in accounting practice, many able minds have been engaged in developing the mechanical phases of ledger work. There are several types of ledgers to be considered. There is the "sewed"

ledger with its stiff or flexible covers firmly attached to the individual volume, cover and leaves forming a unit. The "card" ledger, with a tray, desk, or cabinet as a container for the loose cards, is another development. The mechanically bound "loose-leaf" ledger completes the list.

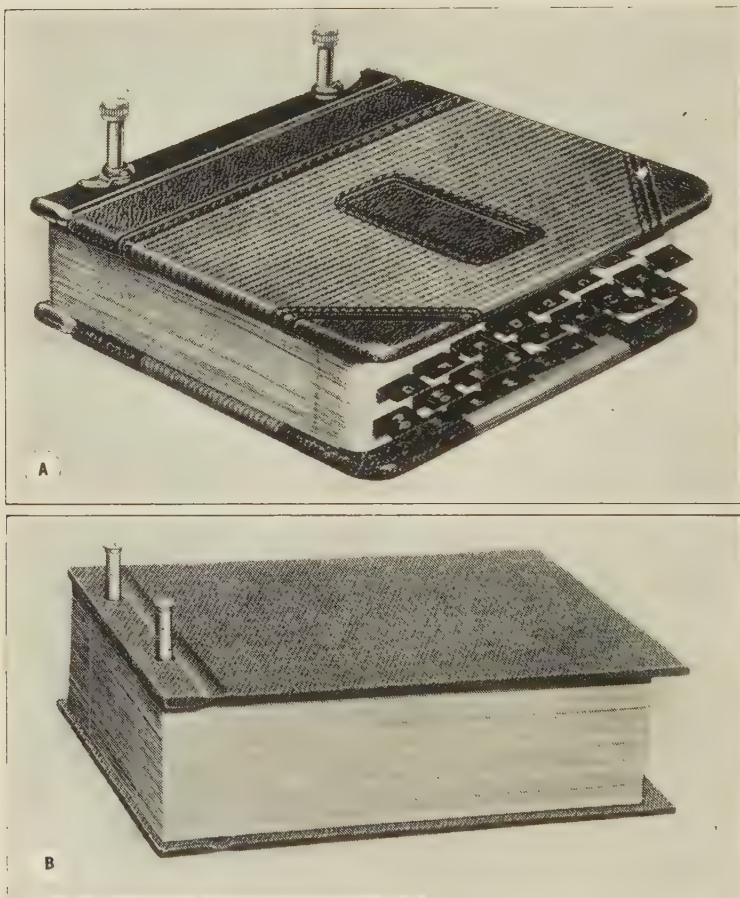


Figure 360: These two binders are also of the sectional-post type, but each has a distinct individual feature. Binder A has an automatic locking device which eliminates the necessity for keys. Note the individual locking unit attached to each post. Compression is secured in binder B by the closing screws. This style binder is usually designed for storage purposes.

Bound Ledgers. The sewed ledger came into universal use several centuries ago. That it remained so long unchanged, except for minor details, was no doubt due to several causes, chief among which were the age-old spirit of conservatism and the absence of a pressing need for something better, because on account of the lack of transportation facilities and consequently the confined area of commercial activity, individual businesses, as a rule, were relatively small. It remained for the United States, unfettered by custom and tradition, to work out the tools in keeping with the growing complexity of modern commerce.

From the present point of view, the sewed ledger has many shortcomings. It wastes time in indexing, in posting, in balancing, and in the recurring necessity of opening a new ledger. It cannot keep the vital statistics of a business conveniently available for reference. It soon scatters the data of a single account to several places in the book or to places in several books. It requires that closed accounts be

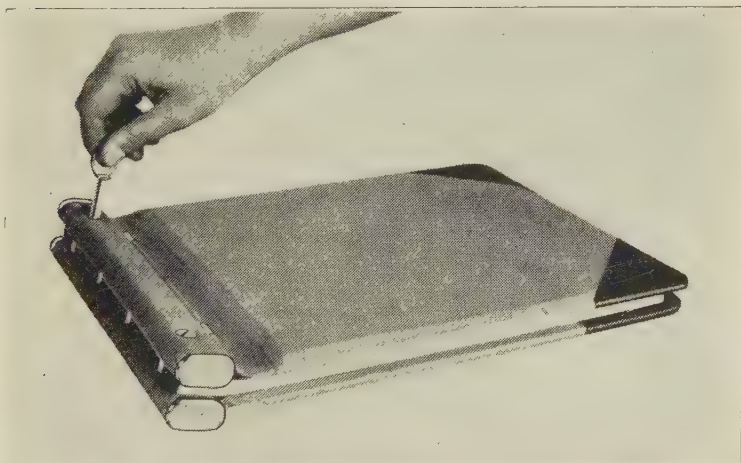


Figure 361: This sectional-post binder is equipped with springs and a screw top which permits automatic expansion. By turning a coin in the screw cap of each post the spring is released, thus causing the post to spring up. See page 777 for added information.



Figure 362: Hinged-post binders are constructed with posts hinged to the ends of the bottom metal part. When loosened at the top these posts swing outward on their hinges and leave the contents of the binder completely unbound. Thus the posts are entirely outside the leaves except for semi-circular punchings at the outer edges of the binding margin. See page 778 for further description.

scrutinized in searching for desired information. Furthermore, it does not provide for expansion and the resulting rearrangement of accounts.

The First "Boston" Ledger. The Boston ledger came as an innovation of real merit. It was not a new device, but an attempt to avoid objectionable features by injecting a new principle into the method of carrying on the record. The Boston ledger, or Boston bank ledger, as it was often called, since it originated in connection with customers' ledger work in Boston banks, utilized the bound book. It first sought to show the balance of each account currently through the agency of a separate "balance" column, and later sought to separate the work of each day or period by using a new set of columns. Accounts were thus carried forward daily or at frequent intervals, along a horizontal line, rather than occupying a definite page position.

From these two ideas a new system of record-keeping was developed. Naturally, the test of time brought many changes. However, the quick popularity of the Boston ledger was evidence of a general dissatisfaction with the old, laborious methods and of an eager reaching out for something better.

Card Ledgers. The card ledger offered advantages over the sewed, bound book. The card, on which but one account is kept, is of sufficient thickness and strength to stand upright, and is ruled on one or both sides, according to the form required. Ledger cards are filed in a tray, or a drawer of a cabinet or desk. Not being permanently bound, as in the sewed book, it is possible to maintain a continuous indexing arrangement, which is not possible in bound books. New accounts can be added without limit, and closed accounts or the filled cards of active accounts can be removed from the current files the moment the work is proved. The transferred record, either filled or closed, may be maintained in a definite arrangement paralleling the current record, for as long a period as desired.

These characteristics, which also admit of any desired units in control and in operation, mark the essential differences between modern card records and the old-type bound book. Flexibility with regard to the insertion, expansion, or removal of individual accounts, and the possibility of a permanent arrangement of control units, were tremendous improvements.

Loose-Leaf Ledgers. Three other elements, however, were earnestly sought—compactness, security, and the elimination of the need for removal of records for entry or reference. The loose-leaf ledger gave these and all the essential advantages previously suggested.



Figure 363: The chain-post binder shown here is constructed of sections hinged together by links so that when pulled into a channel in the metal part there is no post projection. For further details on chain-post binders, see pages 778 and 779.

They utilized and improved the ledger paper which long experience had developed for rapid and permanent pen work. They employed the principle of one account to the leaf—the unit system—which permitted segregation of active and inactive accounts and any arrangement of accounts, alphabetic, geographical, numerical, or any other. They permitted permanent controls, expansion and subdivision of books or sections of accounts, and provided small working units which made it possible to use a binder for reference purposes without unduly interfering with the work of the machine operator or bookkeeper. They were light and easy to handle, were readily accommodated in the safe, and provided for a large number of accounts in a minimum of space.

The rapid headway made by the loose-leaf idea was due largely to its adaptability to all classes of office records—original, intermediate, and final. This adaptability to practically every known activity in the accounting field made possible the tremendous advances in accounting practice in the past 35 years, including the development of machine bookkeeping.

Naturally enough, the loose-leaf idea did not originate with the ledger. The sales order-blank which in 1888 was fast becoming accepted, together with the principle of filing separate sheets in binders, was the father of the loose-leaf idea. In fact, the first attempts at a loose-leaf ledger were efforts to adapt the solid post, consecutive filing order-blank binder to ledger use.

THE FIRST PRACTICAL LOOSE-LEAF LEDGER

The first loose-leaf ledger was put on the market early in the year 1894. Two years prior to this, William A. Vawter had tried to create a loose-leaf ledger¹ for his own work. Contemporaneous with him in the development of the loose-leaf ledger was H. C. Miller.

¹These early ledgers were sold in 1894 by the company which is now Baker-Vawter Company.



Figure 364: The locking and expansion of the binder in illustration A is controlled by a tube threaded on the inside and tapered so that it telescopes into another tube attached to the bottom bar. Illustration B represents an expansion screw style, and illustration C is a telescoping-post binder consisting of tubular posts which slide over interposts. See pages 779 to 781.

At first it was attempted to use the same heavy-weight ledger paper that had previously been used in the bound book. The first efforts were unsatisfactory, the method of binding these stiff sheets not allowing them to bend sufficiently at the hinge, which, in turn, made it difficult to write in the ledger. Meantime a bond paper was used which gave the desired flexibility but possessed too many points of weakness for practical ledger work.

Many experiments were made, and at last the idea of using a linen hinge was developed. This consisted of a piece of linen on the edge of which was pasted a paper strip about one inch wide. To the other edge of this linen strip was pasted the ledger leaf itself. The ledger leaves were cut in three different widths and the linen so arranged as to take up this varying width of the sheets. The sheets were then gathered in sets, so that the "swell" occasioned by the pasting of the linen on the ledger sheet would be divided into three parts. The thickness of the paper-stripped linen at the binding edge was sufficient to take up the "swell" caused by the pasting of the linen on the sheets themselves, thus binding firmly. This made the opening of the book more satisfactory, but it was quite expensive; yet, notwithstanding the cost, it was used very generally for a considerable time.

Finally, however, a method was devised whereby the leaves were creased or "crimped" at the binding margin, which made the linen hinge no longer necessary. Various other devices for breaking the hinge were later adopted—for example, a bond-hinge ledger paper, which gave good results.

An entirely different line of effort to produce a good opening feature and a flat writing surface led to the development of binders that would roll to the left or the right according to which side the operator wanted to work on, and to binders with flexible steel or leather straps instead of binding posts.

The improvement of devices, and further developments in connection with loose-leaf generally, produced logical

plans so that today good opening qualities in binders are easily secured.

The first permanent types of "current ledger" binder appeared on the market about 1899 and were of what is known as "enclosed back" or "metal back" type, with either a flat or a round back. They were made with telescoping posts and with a locking mechanism in the back. Certain binders employed a screw mechanism which, by winding or unwinding with a crank or key, would expand or contract the back. Others employed springs within the posts or in the back, which expanded the back at a partial turn of a key. In each type, leaves could be inserted or removed as soon as the back was expanded, and the book when closed held the leaves under compression. The variable capacity of these books was gradually increased to from 75% to 85%.

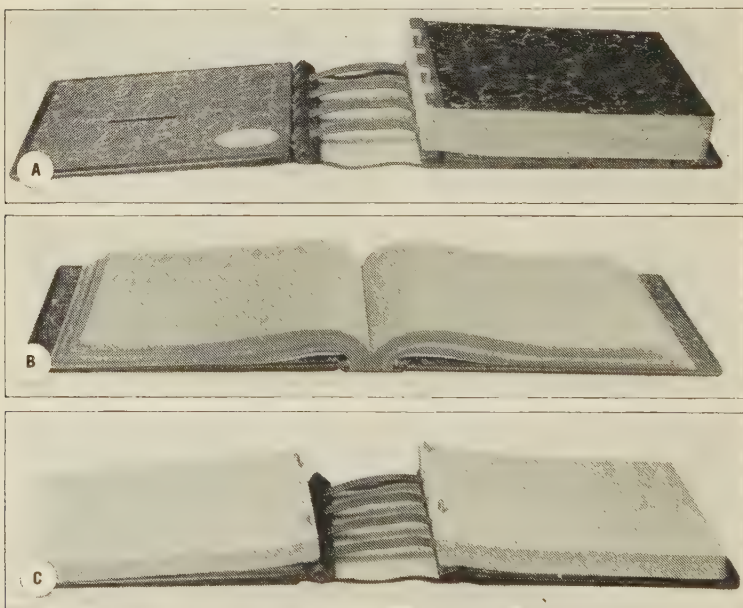


Figure 365: The three views of the binder shown here represent the thong and post combination binder which employs leather or fabric straps and removable posts. The leaves are punched with open "U" and round holes. This device can be used either with hand or machine accounting.

These binders have continued in use with steady improvement in mechanical construction, until today there are a number of excellent metal-back binders on the market.

Sectional-post binders, which have become very widely used, were invented in 1897. The posts are permanently attached to the bottom cover. The top cover slides on the posts through holes provided on the binding edge, and can be locked at any position on the posts or firmly on the sheets. This type of binder accommodates any quantity of leaves and is now made in one style or another by practically all manufacturers of loose-leaf binders.

About 1904 the "thong" type of binder came on the market. This device was also constructed as to enable the bookkeeper to use any quantity of sheets, from one leaf to six or seven inches of leaves. The mechanism, instead of being carried in the backbone of the book, was carried in the cover. This type of binder was made with a leather thong and with a spring steel band. A recent development is the combination thong and post type.¹ This device combines the early thong development with a new principle which has created a new and effective binder.

Fixed-capacity binders of several types, and ring and prong binders were early in the field. They fill a number of needs, but are little used in the major ledger and accounting record field.

In 1914 the development of open-slot punching of leaves brought modifications of all types of binders to meet the demand of the bookkeeping machines.

IMPORTANCE OF THE LOOSE-LEAF IDEA TO PRESENT-DAY BUSINESS

The loose-leaf idea was an aid to the development of machine bookkeeping. Without the unit system and an efficient means for handling leaves of all weights and thick-

¹Manufactured by such companies as Kalamazoo Loose Leaf Binder Company.

nesses, mechanical accounting would have suffered many physical handicaps. The actual work of the machine in making the record occupies only a very small part of the time; the rest of the time is consumed in handling the record. In order, then, that machines might be really productive, efficient devices were required to be used in conjunction with them. The loose-leaf devices offered the efficient means of handling the records while in process of making.

Modern efficient methods of accounting all employ the loose-leaf idea in one or more of its many forms. The recording of big business today is truly an intricate matter. Loose-leaf, however, has resolved it into its simplest form, permitting manifolding, sorting, tabulation, and a dozen short-cut methods to take the place of slow, laborious posting and copying.

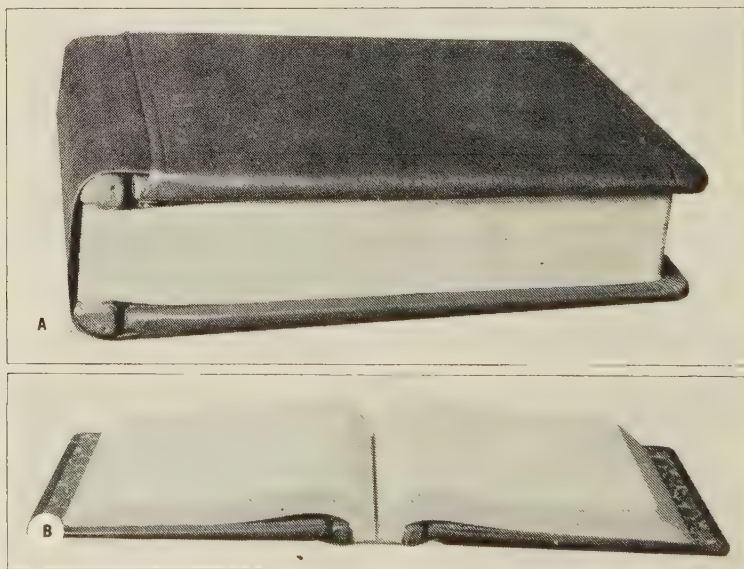


Figure 366: Here is a thong binder which is used for heavy ledger work. It is also adaptable to machine accounting. Figure 367 shows how this type of ledger is used with accounting machines, and Figure 368 illustrates mechanical posting equipment.

The use of carbon-paper and the development of its possibilities in producing partial or complete copies of both original and final entries is a valuable adjunct to loose-leaf equipment. Manifolded has probably saved more labor and done more to make it easy to establish the correctness of records than any other single element in the relief of office drudgery and the progress of modern accounting.

Accounting is at its best when it tells the complete story, in its simplest form, with the least labor. Without the aid of loose-leaf systems the accounting work of our large industries would be almost impossible to accomplish, even at great cost, and the wheels of business would be effectually locked. To the development of loose-leaf devices, the manifolded idea, scientific filing, and the consequent simplification of accounting practice, the business world owes a deep debt of gratitude.

Advantages of Loose-Leaf Systems. The advantages which result from the use of a loose-leaf system in keeping accounts may be summed up as follows:

1. Eliminating the reopening of accounts from year to year;
2. Eliminating the necessity of an index, as accounts may usually be filed in some predetermined order;
3. Eliminating the necessity of daily handling of dead matter, as expired accounts are transferred into special binders;
4. Ease of securing condensed monthly abstracts in alphabetic or numerical order by retaining in current binders only the open accounts, and not having to pay attention to the closed accounts;
5. The ability to do manifolded in alphabetic and similar definitely arranged records, eliminating the copying of monthly statements, and so forth;
6. The ability to place in alphabetic or numerical order original charge- and credit-posting media, including the drafts or receipts settling the open accounts;
7. The introduction of manifolded, sorting, tabulating, and filing in place of copying and posting, reducing labor and increasing accuracy;
8. Ease of finding original records of any transaction by reason of their alphabetic or numerical arrangement;

9. Less likelihood of error in transcription or proof because of registering only open accounts instead of having to register both the open and the closed accounts;

10. Lessening of the chances of error both in posting and in striking a balance because one is concerned only with open accounts in a ledger from which all closed accounts have been removed;

11. Less chance of error in current work through handling

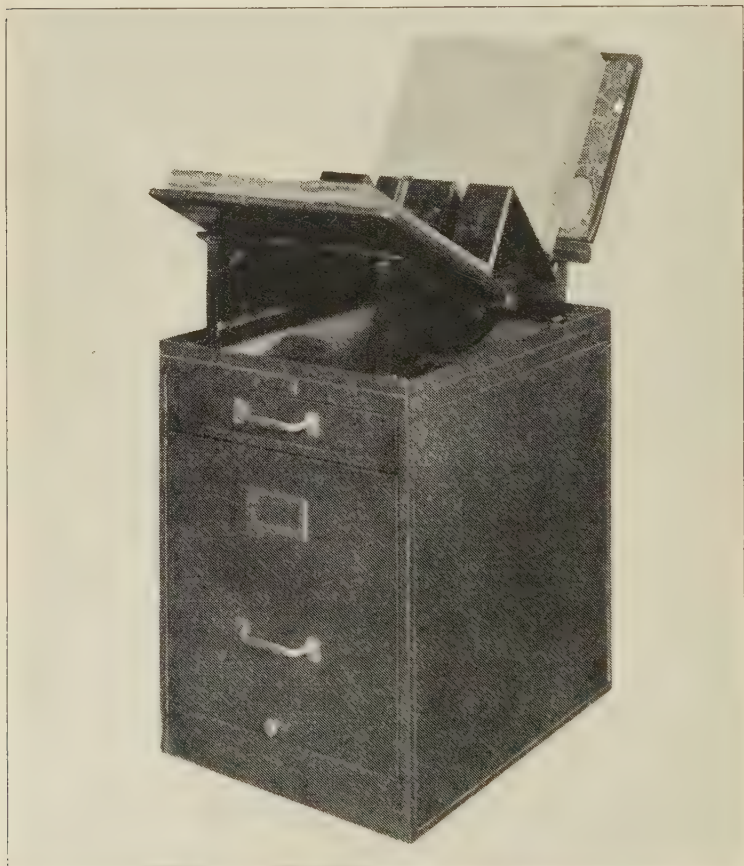


Figure 367: This W-shaped type of binder rack is specially built for the promotion of easier posting and proving. Notice how the center of the rack is cut so that the thongs slip into the slots and may be extended to their full length.

fewer figures, since many posting references previously necessary are eliminated by simple account arrangement;

12. Lessening of the weight of books to be handled daily, since only the active portion of open accounts is kept in the current binders;

13. Doing away with the detail statement of all accounts, often occupying 10 or 20 pages and requiring reanalysis to establish a financial or operating statement, by permitting classification, permanent grouping and control, making condensed statements easy to create and to prove;

14. Finding at first glance the condition of any account whatever, running back for years;

15. Finding them with facility, although the accounts may not have been open for years;

16. Any desired division or arrangement of accounts, if one wishes ultimately to compile statistics according to country, district, or region;

17. The possibility of segregating in a special division of the records all the accounts for special inspection, litigation, and so on. Delinquent accounts, dishonored draft accounts, and a wide range of "special attention" records may in this way receive more rigid survey;

18. Ease of replacing soiled leaves without having to rewrite an entire book, or use the soiled one for a year or two;

19. Ease of establishing proof of correctness of individual accounts or of records as a whole, so that removal and replacement of accounts becomes both safe and desirable;

20. Ease of placing unsettled accounts in the vault or safe for special protection;

21. Finally, economy. The bindings and division leaves should serve indefinitely and one has only to replace the leaves that have already completely served their purpose;

22. The greatest economy, however, lies in the labor-saving element of loose-leaf systems. Because of the simpler, more direct way of working, loose-leaf records save man-power in the office and increase man-efficiency. Since the continuous expense of operating records is vastly greater than the per annum cost of records and equipment, the greatest saving effected by loose-leaf methods is at this point.

LOOSE-LEAF EQUIPMENT

Proper equipment is as essential to the success of a system as the idea itself. Let us consider, then, three impor-

tant factors which make up a loose-leaf equipment: the binders, the paper used, and the system.

LOOSE-LEAF BINDERS

Necessity for keeping records in neat, compact, accessible form has fostered the invention of various types of binders. There are current ledger binders; current binders for records of Register or Cash and Journal type; transfer and storage binders; meter-reading and route books; catalog and price-book binders; fixed-capacity binders which have a removable leaf feature during the preparation of a record and can become permanently bound books after the record has been completed; and many other types designed to meet the growing needs of industry. So great is the need for variety in binders that there are now many different kinds offered for every business use. The ultimate purpose—to keep records—divides itself naturally into a limited number of requirements; therefore, the tendency toward standardization of type is growing. This tendency has developed several major types of binders: solid-post, sectional-post, chain-post, tubular-post, thong, telescoping metal back, fixed capacity, and ring and prong.

SOLID-POST BINDERS¹

Binders of the solid-post type are made in two principal styles: threaded post, and smooth post.

¹Solid-post binders are manufactured by such companies as Accounting Devices Company; American Loose Leaf Mfg. Company; Baker-Vawter Company; Boorum & Pease Company; Dameron-Pierson Company, Ltd.; Charles R. Hadley Company; The H. R. Huntting Company; Irving-Pitt Manufacturing Company; William G. Johnston Company; Kalamazoo Loose-Leaf Company; Lefebure Ledger Company; William Mann Company; McBee Binder Company; McMillan Book Company; H. C. Miller Company; John C. Moore Corporation; National Blank Book Company; Proudfit Loose-Leaf Company; The Richmond & Backus Company; Stationers Loose-Leaf Company; Steel Back File & Ledger Company; Hugh Stephens Manufacturing Company; Tallman, Robbins & Company; The Sam'l C. Tatum Company; The Tenacity Manufacturing Company; Tengel Company; Wilson Jones Loose-Leaf Company; Workman Manufacturing Company.

Threaded Solid-Post Binders. The original loose-leaf binder was made with solid threaded posts, the top cover being locked into position with nuts which screwed down over the posts, to the desired capacity. This type of binder, as shown in illustration A of Figure 358, is still widely sold, but its use is now confined to storage purposes for records filed in numerical or other consecutive order.

The posts are usually $5/16$ inch or $3/8$ inch in diameter, in varying lengths to suit individual requirements. The two principal kinds consist of those in which the posts are fixed in a metal bar inside the binding edge of the bottom cover, and those in which the posts are practically separate from the covers and consist of a U-shaped wire threaded on both ends.

Smooth Solid-Post Binders. The spring-lock solid-post binder was the first post-binding device of variable capacity made with the posts not threaded. A locking spring attached to a bar which slides down over the smooth posts has two holes a trifle farther apart than those in the bar (see illustrations B and C of Figure 358). Pushing down on the bar causes the binder cover to slide down the posts and the spring to lock tightly upon them until released by inserting fingers between bar and spring. The device was simple but it was also effective, and it still remains in use today. It is most desirable for accumulating consecutively filed blanks until its capacity is reached, when the flat spring bar slips into notches at the top of the posts and it becomes a permanent binder.

Top-lock and end-lock solid-post binders constitute another style, for current accumulation only. Unit forms (order blanks, sales tickets, and so forth) are filed in numerical or other consecutive order until the desired capacity is reached, when the contents are removed and placed in a permanent binder, usually of threaded solid-post type. These top-lock binders are made with a lock in the center or end of the locking bar of the top cover, or with a thumb latch or

slide lock. In most styles the top cover slides down over the posts, but in some instances it slips directly onto the posts at any point by means of open slots in the lock.

SECTIONAL-POST BINDERS¹

The invention of the sectional-post binder marked one of the most important forward steps in the evolution of loose-leaf systems. It is so well known that it scarcely requires description, and in one style or another is now made by practically every loose-leaf manufacturer.

The smooth steel posts usually screw together and into base sections firmly attached to the bottom bar. These posts are usually $5/16$ inch or $3/8$ inch in diameter and are finished in sections 1 inch or $1/2$ inch in length. This permits any desired length to protrude through the top cover to give expansion for removal and insertion of leaves, and allows for adding sections as the need for additional capacity increases. The simple, rigid construction thus provided assures great durability.

Another style, often called "chain post," has the various sections united by flat links (instead of screwing together) to permit the posts to fold down instead of project above the top cover.

The variable capacity of sectional-post binders, accommodating any number of leaves from one up, and their availability in every grade of binding, their simple con-

¹Sectional-post binders are manufactured by such companies as Accounting Devices Company; American Loose-Leaf Mfg. Company; Baker-Vawter Company; Boorum & Pease Company; Dameron-Pierson Company, Ltd.; Charles R. Hadley Company; Heinn Company; The H. R. Hunting Company; Irving-Pitt Manufacturing Company; William G. Johnston Company; Kalamazoo Loose-Leaf Company; Lefebure Ledger Company; William Mann Company; McBee Binder Company; McDonald Ledger & Loose-Leaf Company; McMillan Book Company; H. C. Miller Company; John Moore Corporation; National Blank Book Company; Proudfit Loose-Leaf Company; The Richmond & Backus Company; Stationers Loose-Leaf Company; Steel Back File & Ledger Company; Hugh Stephens Manufacturing Company; Tallman, Robbins & Company; The Sam'l C. Tatum Company; The Tenacity Manufacturing Company; Tengwall Company; Wilson Jones Loose-Leaf Company; Workman Manufacturing Company.

struction and great durability, account largely for their wide popularity. Two styles of "cap" sections are used on the posts. They are known as "pointed" and "ball" caps, and are designed either to assist in, or to prevent, the ready removal of the top cover. These cap sections are made of



Figure 368: Mechanical posting and proving are facilitated by the use of loose-leaf binders and binder racks as this illustration indicates. Such equipment allows the operator freedom from the many irksome details and thus makes possible absolute concentration on the work.

steel, rubber, felt, or other material, depending on the purpose they must serve. The chief distinctions between binders of this type appear in the types of locking mechanism and the materials used in the construction of the binders.

Top-Lock Sectional-Post Binders. The type of binder shown in A of Figure 359 locks from the center of the top-locking bar either with a key, an attached wing nut, or a slide latch or button. The wing nut affords a convenient handle by which the operator lifts or depresses the cover while locking or unlocking the binder. There is considerable variation in the continuous successful operation of these locks, depending upon the style of construction.

End-Lock Sectional-Post Binders. Note in B of Figure 359 how this style of binder locks against the posts in much the same manner as the top-lock type, but note also that the lock of this style is actuated from the end of the top-locking bar by means of either a removable key or a push button. The end-lock type is especially indicated for machine bookkeeping binders where it is desired to remove the top cover but keep it on the desk while operating. Here, too, the mechanical principle involved has much to do with the permanent security of the locking mechanism.

Automatic Locking Sectional-Post Binders. This type of binder, shown in A of Figure 360, has an individual locking unit for each post, each of which locks independently and automatically. No keys are employed. The binder locks itself, the lock not being of the usual compression type but of the ball and wedge type, which makes it not only practically indestructible but positive in its action. Convenient thumb levers release the locking units to allow the covers to be expanded. If desired to be held open, a special cap section accomplishes this. In closing, the top cover drops of its own weight and locks automatically. If additional compression is desired, hand pressure accomplishes it; the lock holds at any point and under any pressure.

Closing Screw Sectional-Post Binders. This style of binder

is designed solely for storage purposes. While it is offered in several bindings according to the character and amount of reference which its contents will require, its construction is inexpensive. There are no locking mechanism and no post projection, but good compression is secured through the closing screws (see illustration B of Figure 360). Post sections in 1-inch and $\frac{1}{2}$ -inch lengths and a closing screw for the top of each post provide the only mechanism.

Sectional-Post Binders with Automatic Expansion. The type of binder shown in Figure 361 is unique and of recent construction. The posts are equipped with springs and the top section has a screw cap which countersinks into the top cover. A half-turn of a coin inserted in the screw cap of each post releases the spring and causes the post to spring up. The cover may then be lifted from the sheets but need not be removed from the posts as sheets are inserted or removed. More sections may be added to each post for increased capacity.

Viselock Sectional-Post Binder. Another type that has no operating levers employs a rubber-grip locking device. By turning the grip the binder is locked or unlocked. Rubber caps fitted over a grooved nut to prevent their coming off the post section are used to protect office desks and

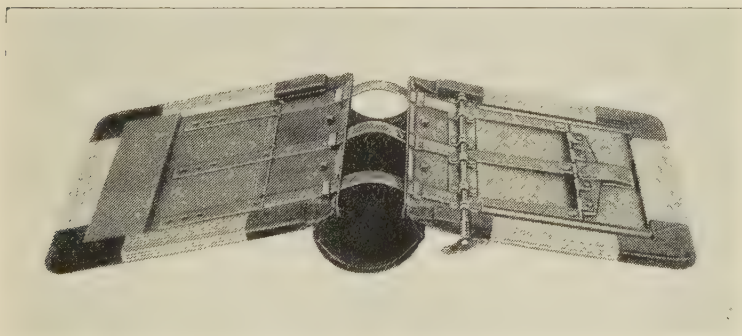


Figure 369: The steel-strap style binder has, as the name implies, strips of steel tape attached to swing covers. The spring mechanism within the cover allows a very high degree of expansion. For further details, see page 782.

furniture. This type of binder is adaptable to machine book-keeping, although its widest use is for hand-posted ledgers and records.

Pivot-Post Binders. Another distinct style of sectional-post binder, shown in Figure 362 has posts hinged to the ends of the bottom metal part. Slotted cups at the ends of the top metal part engage rounded nuts which screw down upon the threaded cap sections. When loosened at the top these posts swing outward on their hinges and leave the contents of the binder completely unbound. Thus the posts are entirely outside the leaves except for semicircular punchings at the outer edges of the binding margin. Like all sectional-post binders, their capacity is variable from a single leaf to an unlimited quantity. This binder is designed for machine-kept records only and is not recommended for hand-kept records.

CHAIN-POST BINDERS¹

The posts of this type of binder are sections linked together forming a chain device (see illustration A of Figure 363). The flexible quality of the chain-post makes it possible to adjust the opening of the binder at any point desired. Two illustrations of the chain-post binder are shown in Figure 363.

When the mechanism is in the bottom tubing only, and when the chain ends come through the top tubing, the key inserted at the end of the bottom metal part produces compression by pulling the posts into the metal end of the cover rather than by simply pressing down upon, and locking the cover at a given point on the posts. However, when the mechanism is in both tubings the compression which locks the sheets can be exerted from either top or bottom cover. Sheets can be inserted or removed singly or in groups, and,

¹Manufactured by such companies as Accounting Devices Company; H. C. Miller Company.

furthermore, by means of the chain-post this type of binder can lock one sheet or one thousand sheets without the addition of a section. The rounded surface in the tubing permits the binder to swing on an arc, giving a flat writing surface to any sheet in the binder.

TUBULAR-POST BINDERS¹

This type of binder embraces several styles designed for as many different purposes. They employ no locking mechanism, relying on closing screws—usually inserted through the top cover—for their compression grip upon the contents. While this results in a slower operation in “locking,” this type of binder is designed for uses where little or no locking or unlocking is required, and where lightness and compactness are of greater importance than the operation of opening and closing. Their simple construction assures great durability.

Adjustable-Tube Binders. The binders which are designed mainly for storage service are also sometimes used for catalog and similar purposes where little removal or insertion of leaves is contemplated. While this kind of binder is offered in several bindings according to the character and amount of reference which its contents will require, its construction is inexpensive. A tube upon a screw base and a closing screw for the top of each post provide for adjusting the thickness of the binder to the quantity of leaves to be filed. This style is similar in outward appearance to illustration B of Figure 360. It differs only in construction.

Expansion-Tube Binders. The locking and expansion of the style binder shown in illustration A of Figure 364 is controlled by a tube threaded on the inside and tapered,

¹The various styles of the tubular-post binders are manufactured by such companies as American Loose-Leaf Mfg. Company; Baker-Vawter Company; Charles R. Hadley Company; The Heinn Company; The H. R. Hunting Company, Inc.; William Mann Company; The McBee Binder Company; The Richmond & Backus Company.

which telescopes into another tube attached to the bottom bar. The smaller tube is "swelled" at its base by a wedge screw until it binds at the desired point, thus locking the binder. It is somewhat quicker acting than other tubular-post binders, and like them, it has no post projection. It is best known in its use as a catalog binder.

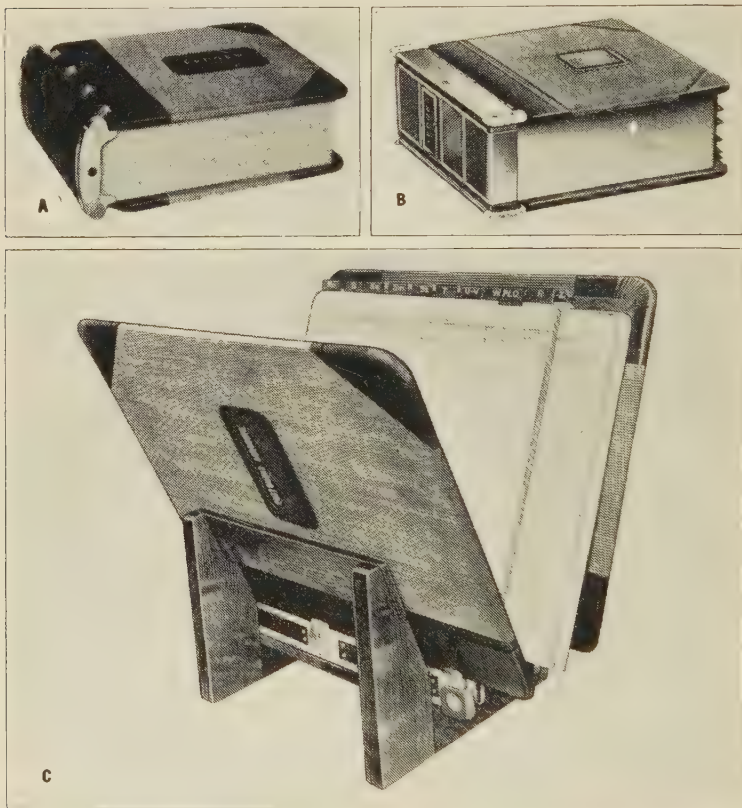


Figure 370: Here are two telescoping-back ledgers. Illustration A, representing the screw-binder, is constructed with a metal back, the roundness of which enables the operator to secure a flat writing surface. The telescoping-back ledger in illustration B has an automatic lock feature. Note the square-back construction. Illustration C indicates how it may be used with machine accounting.

Expansion-Screw Binders. Illustration B of Figure 364 shows a binder which covers a variety of uses such as price book, meter-reading, customers' record, and even pocket ledger. The mechanism usually consists of two or three tubular posts of 3/16-inch to 3/8-inch diameter, threaded on the inside, and one or two closing screws. The bindings cover a wide range from aluminum or fiber board to canvas or leather. They are offered in the smaller sizes only, since in their various uses the records are nearly always on light weights of paper. This secures great compactness.

Telescoping-Post Binders. The binder which is designed for private ledger, catalog, and other office uses which require good bindings but less frequent insertion and removal of leaves is shown in illustration C of Figure 364. It is especially desirable where light construction and moderate capacity are wanted. The mechanism consists of from two to four tubular posts, the outer tubes usually being $\frac{3}{8}$ inch in diameter and sliding over smooth inner tubes or posts. Closing screws, inserted through the top cover into the posts, allow expansion and provide the binding pressure. Posts and tubes are usually attached one part to top and the other to bottom metal parts, alternately. Since these binders are ordinarily used for small-capacity volumes, the covers are often extremely thin, the favorite bindings being flexible or stiff leather. They are made in capacities of $\frac{1}{2}$ inch to 1 inch with an average expansion of 75% to 100%.

THONG BINDERS¹

There are two principal styles of thong or strap-type binders, those employing leather straps and leather flap back covers, and those employing steel bands and attached back covers.

Fabric-Thong Binders. The most widely known of the

¹Thong binders are manufactured by such companies as Kalamazoo Loose-Leaf Binder Company; Proud Fit Loose-Leaf Company; and Sieber Products Manufacturing Company.

thong or strap binders are those in which flat sewed leather or fabric straps take the place of posts, and also serve as a means of compression. Binders of the thong style have sheets punched with elongated slotted openings, which fit snugly around the strap; but leaves can be easily removed or inserted. Note the construction in Figure 365.

These binders have a variable capacity from one to any practical number of sheets, depending entirely upon their purpose. When open they furnish a flat surface for writing. Alinement of leaves is secured by the thongs, and additional mechanical pressure is secured through a screw device in the cover, to hold them firmly. Figure 366 pictures a combination thong and post-type binder.

The thong binder is easily adapted to mechanical posting. An open slot punching of the leaves is used, and a W-shaped binder rack is provided. The binder is placed on one side of the rack, and thongs are extended to full length (see Figures 367 and 368). The top cover is then placed on the opposite side of the rack, the straps dropping out of the open-slot punching and being accommodated by openings in the rack. With all leaves thus on one side of the rack, work is organized to proceed in the order of their arrangement. As they are removed from the machine they are returned to the opposite side of the binder in the rack, face downward. When posting is completed it takes but a moment to move the remaining cover to the side which now contains the leaves, and tighten up the straps to make a securely bound volume.

Steel-Strap Binders. The expansion of the steel-strap type, like that of the leather-strap binders of thong type, is controlled by mechanism within the cover. Note in Figure 369 how the locking device is arranged in the cover.

The enclosure of the back is continuous between top and bottom covers, thus giving an appearance more like a bound book. This, however, puts a definite limit on the maximum capacity. The minimum capacity is also more fixed, as the

mechanism grips most readily a quantity of several leaves.

In both styles of thong binder a certain flexibility of the back, as compared with post binders, assists in securing a flat writing surface.

TELESCOPING-BACK BINDERS¹

The metal-back binders comprise the first permanent styles of loose-leaf binder for current ledger for pen use, and their direct successors.

The principal styles are popularly referred to as the round back and the square back. There are, however, several distinct kinds of each style. All are designed to hold under compression a quantity of leaves, found to be a good working unit, variations within each unit being accommodated by binder expansion of from 75% to 95%.

Screw-Lock Binders. This style is usually made with a three-part round back of pressed steel or cast aluminum. Attached to the center part is a two-way screw mechanism with riders, to each of which are attached short arms which expand or contract the outer parts as the screw is turned (see illustration A of Figure 370). Four telescoping posts, placed alternately on opposite sides of the metal back, secure alinement of leaves. The roundness of the back permits the operator to roll the book to the right or left, to secure a flat writing surface on the side upon which he is working.

Turn-Post Binders. In outward appearance the turn-post binder is similar to that shown in illustration B, of Figure

¹Telescoping-back binders are manufactured by such companies as American Loose-Leaf Mfg. Company; Baker-Vawter Company; Heinn Company; The H. R. Huntting Company; Irving-Pitt Manufacturing Company; William G. Johnston Company; Lefebure Ledger Company; William Mann Company; The McBee Binder Company; McDonald Ledger & Loose-Leaf Company; H. C. Miller Company; John C. Moore Corporation; National Blank Book Company; The Richmond & Backus Company; Stationers Loose-Leaf Company; Tallman, Robbins & Company; The Sam'l C. Tatum Company; The Tenacity Manufacturing Company; Wilson Jones Loose-Leaf Company.

364. The posts, however, are elliptical instead of cylindrical in shape, and the turning of the key which expands or contracts the binder also turns the posts so that they either hold the leaves in the binder or allow them to slip out readily. Detachable arms fitted into slots in front and back covers

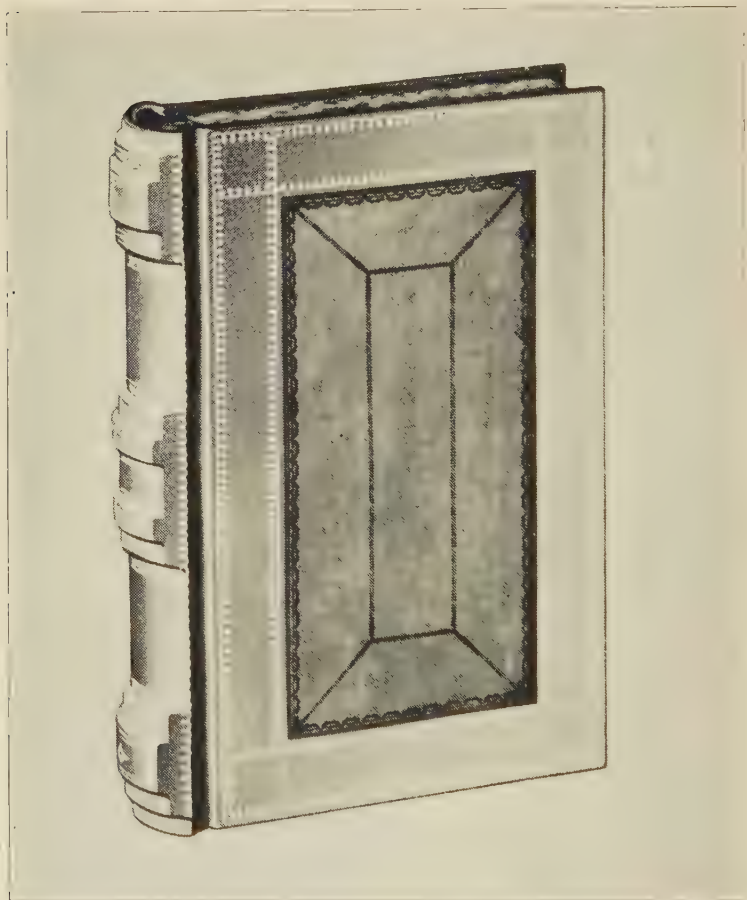


Figure 371: This round-back binder of fixed-capacity type looks like a bound volume. It is, however, a loose-leaf ledger with a mechanism which consists of hinge pins or other fastening devices which are often detachable at either side so that leaves may be removed from the front of the book.

convert this binder into an upright machine-bookkeeping binder.

Automatic-Lock Binders. One of the quickest-acting binders of telescoping back type is the one shown in illustration B of Figure 370. It is called the automatic-lock binder. A slight turn of a key and it opens itself. Simple pressure closes it, locking positively at any point between its minimum and its maximum capacity. Some styles are made keyless, locking being done by thumb-screws.

The construction of this kind of binder permits excellent cushioning to protect both binder and desk. The firmness of the record in operation, due to the square back, is equally advantageous in this binder when adapted to machine-bookkeeping use, for which it is simply placed vertically in a rack especially constructed for the purpose (see illustration C of Figure 370).

FIXED-CAPACITY BINDERS¹

Binders of fixed capacities are often used on records of typewritten journal or day-book type; however, they may be used for ledger and similar records. They also are made in two principal styles: round-back and square-back.

Round-Back Fixed-Capacity Binders. The most widely used binders of the round-back style have the appearance of bound books (see Figure 371). The leaves are punched with solid holes (sometimes rectangular) through which run rods or metal straps hinged to top and bottom covers. These covers are also attached to each other after the manner of the bound book. The hinge pins or other fastening devices are often detachable at either side so that leaves may be removed from the front of the book, used for record purposes, and replaced at the back of the book.

¹Fixed-capacity binders are manufactured by such companies as Irving-Pitt Manufacturing Company; Kalamazoo Loose-Leaf Binder Company; William Mann Company; McMillan Book Company, and John C. Moore Corporation.

Square-Back Fixed-Capacity Binders. The square-back binders of the fixed-capacity type have top and bottom metal parts with two solid posts each, so arranged that the binder can be readily separated at any point for the removal or insertion of leaves. Leaves are not held in by compression, so that when the binder contains anything less than the maximum quantity, the hold of the binder depends entirely upon the strength of the paper beyond the punch holes. These binders are used for ledgers, journals, day-books, billing sheets, machine posting, and, in fact, all kinds of cost-accounting forms.

RING AND PRONG BINDERS¹

Figure 372 shows the interior of a ring-binder and indicates how it holds leaves with solid hole punching by means of metal rings run through these holes. Neither the ring nor the prong type has any compression upon the contents, and, like fixed-capacity binders, the strength of the hold upon the leaves depends entirely upon the strength of the paper beyond the punch holes. They are popular for "memo" books, "price" books, "tariff" folders, and general note work, and are designed to handle small quantities of material. Some thick books of this type are offered, but the sale is limited, since they wear out the paper at the punchings if reference is at all frequent.

There are numerous other binders made for special purposes. In fact, the popularity and success of loose-leaf equipment may be traced to its utility and the ease with which it may be adapted to meet almost every requirement

¹Ring and prong binders are manufactured by such companies as Accounting Devices Company; Heinn Company; The H. R. Huntting Company; Irving-Pitt Manufacturing Company; H. C. Miller Company; William Mann Company; McBee Binder Company; McMillan Book Company; National Blank Book Company; Stationers Loose-Leaf Company; Sam'l C. Tatum Company; The Tenacity Manufacturing Company; Tengwall Company; Trussell Manufacturing Company; Wilson Jones Loose-Leaf Company; Workman Manufacturing Company.

of modern business. Figure 373 shows two binders made for special work.

Multiple Prong-Binder. Instead of the 4 to 8 prongs used by the usual style prong-binder, the multiple type provides numerous prongs. The number of prongs is increased to 16, 20, 24 or more, placed at definite intervals on the metal back. The sheets which are used with this style are multiple-punched so that they can be arranged in the binder with edges overlapping about a half-inch. In this way a visible index is created.

Permanent Record Binder. An especially interesting application for loose-leaf binders has been developed for counties or permanent record use. The laborious task of copying, in pen and ink, county records, such as deeds, mortgages, and real estate transfers, has resulted in illegible

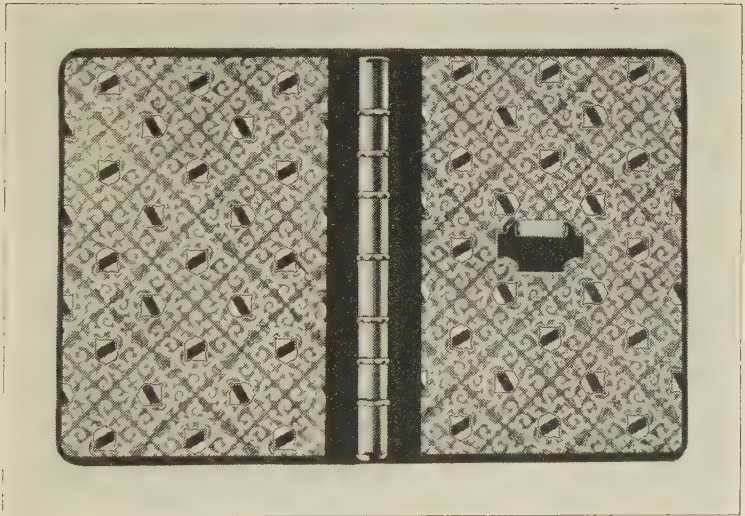


Figure 372: This illustration shows how the fastening device is attached to the back of the binder; it further indicates how the leaves may be inserted in the rings, after perforations have been punched in the edge of the sheets. A spring lock makes it possible to pull the rings apart and snap them together again, thus holding the paper.

records and serious inaccuracies and omissions. The loose-leaf idea allows the records to be typewritten or photographed¹ and bound in the binder after they are finished.

The binder operates as a loose-leaf binder while the record is being written. When the book is filled, the sheet body is bound separate from the cover. The hard and continuous use to which public records are subjected wears out the cover, requiring, in the case of a bound book, a complete job of re-binding. With a loose-leaf binder of this type it is only necessary to transfer the bound-sheet body to a new cover. The binder is of fixed capacity, the sheets being bound to removable bars, and held in the binder by the agency of thongs.

PAPER

The second important factor in loose-leaf equipment is the paper used. There are quite a number of major classes of paper: writing papers, printing papers, blotting papers, book papers—and in each of these classes each manufacturer has a different standard. The early process of paper-making was chiefly guesswork, but through the development of chemistry and photography the manufacturer is now able to study the selection of materials and their treatment in a scientific way.

The invention and development of vertical filing, and the constant improvement of loose-leaf and manifolding ideas, together with the invention of machines for handling almost every phase of office routine, have opened up a vast field for the production of papers specially adapted to the task each must perform.

Much study of paper and paper-making, and many exhaustive tests were necessary before ledger papers of the proper weight, writing and erasing surface, strength, and performance were developed for loose-leaf ledger work. The

¹A special machine for photographing records of this character is manufactured by such companies as The Photostat Company. This is a feature of Kalamazoo public records binders.

same process was repeated in developing papers for billing forms, order-blanks, bills of lading, voucher checks, machine posting ledger leaves, and statements.

Although the process of paper-making is highly developed, difficulties which arise in the manufacture bring forth variations, even in the same quality paper. There are, in fact, four physical qualities of paper—thickness, finish, strength, and color—which it is still impossible to control absolutely.

Thickness is indeed a real problem to paper manufacturers. It is often impossible to prevent a slight difference in weight. While adjusting a paper machine to the exact thickness to make the desired weight, some paper must inevitably go through the machine either lighter or heavier than it should be. The whole run of paper may average the specified weight yet contain a small amount of stock over or under the proper weight.

Finish is an important factor. By means of a calender machine a certain gloss in the finish may be attained, but even though the same paper stock is run under conditions as nearly identical as it is possible to create, it is difficult to produce the exact and identical finish. Atmospheric conditions are the paper-maker's worst enemy at this point.

The strength of paper depends upon the character of the stock from which it is made and the length of the fiber after the raw material has been through the beater. Long-fibered, new rag stock has the greater strength and is best adapted to ledger use.

The sure test of paper is use, and it is on this that classification must be based. It is necessary to consider how it is to be used, how much handling it will be subjected to, and whether the record it is to retain will have permanent value. Take, as an illustration, a triplicate bill and charge system where one sheet is sent to the customer, the second used as a posting medium, and the third used for analytical work.

The first and second sheets should be high-grade bond of

rag content, not only because a house is often judged by its stationery, but because the customer keeps the first sheet—his invoice—as a permanent part of his records, and the second sheet becomes a permanent part of the seller's accounting records. In some cases it must be kept five years or more. The paper for these two sheets should therefore be made from material which will retain the record without fading. The third sheet may be of inferior quality because it is a temporary record provided to speed up the work of account statistics. When the work for the month is done and verified, this copy of the invoice has little further value.

Exact color or shade is one of the greatest difficulties of paper-making. Different lots of the same stock take different shades of the same color. The brightness of the color depends a great deal on the clearness of the water used in the coloring process. Coloring done under daylight and that done under artificial light naturally differ slightly. The most common colors used for paper are white, canary, buff, golden rod, pink, cherry, salmon, blue, and green.

Ledger paper is generally made in four different weights. An extra heavy weight is used for making index-division leaves for loose-leaf binders. It may be used for ledger leaves or special blanks where extra heavy paper is required.

The second, third, and fourth weights are used for high-

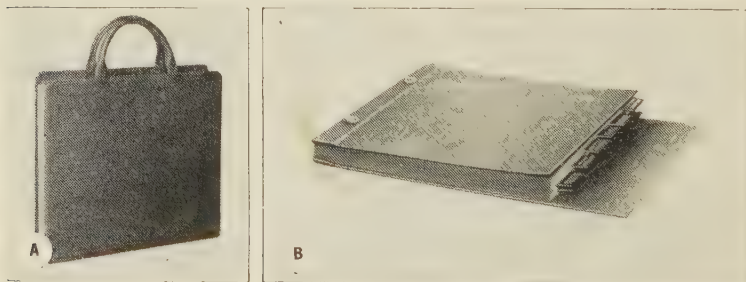


Figure 373: Binders are made in many styles to meet specific requirements. Here are two special binders; Illustration A pictures a catalog binder while Illustration B represents a folding price book. Note the special index.

class accounting records. They are made to withstand every test of regular ledger work. They do not possess space-consuming bulk and, therefore, they greatly increase the number of accounts which can be handled advantageously in each binder. Ledger papers are manufactured in 24, 28, 32, and 36 substance numbers. Substances 24 and 28 are almost universally used for regular ledger and permanent records in loose-leaf binders.

To answer the needs of special types of work other than pen ledger, several specific kinds of paper have been developed. These are bond paper, manila paper, transparent paper, folder stock, guide-card stock, press board, index-card stock, and machine-bookkeeping card and machine-bookkeeping ledger stocks.

Bond paper of the first grade is made from new white cotton and linen cuttings. It differs greatly from stock made with a similar or even higher rag content where old rags are used. The fiber in the new rags has not been lost and consequently the paper is strong.

Bond paper, because of its various weights and qualities, is adaptable to many requirements. The growing demand for manifold work calling for a great number of sheets to a set has necessitated the use of an extremely strong, lightweight paper. Bond papers in second grades are used for commercial statements, instruction blanks, bank deposit tickets, interior letter-heads, and so forth.

Both ledger and bond papers are often water-marked to provide a brand or trade-mark. This marking is accomplished by means of a special roller upon which the design is slightly raised. The paper passes under this roller while soft enough to allow the pulp to become more thoroughly pressed out by the design, thus leaving the form clearly marked in the paper after it has dried.

Manila paper is an entirely wood-pulp stock. It is made in three standard weights and is used for memorandum copies in manifold books and blocks, blanks for carbon-

copy which will not have much handling—bills of lading, shipping receipts, city delivery receipts, and so forth. It is light enough to avoid unnecessary bulk in permanent files, and strong enough for practical use; it has a smooth writing surface and produces good carbon copies. A good “writing manila” will accommodate pen work, but the record will eventually fade.

Transparent paper is a sulphite stock or vegetable parchment and is used only for temporary carbon records. Triplicate manifold order-books are made with the second sheet sufficiently transparent to allow the carbon to show through from the underside. The use of such paper makes it possible to produce two carbon copies with one sheet of “full carbon,” that is, paper carbonized on both sides.

Folder stock is of sufficient flexibility to permit ease in handling, and still is rigid enough to withstand hard usage. A stock with a vertical grain produces the best folder. Where unusual permanence is desired an exceptionally strong folder stock is regularly offered.

Press board, which is an especially thick, strong stock, made for guide cards, is generally used where permanence is desired. It is made in three different weights and thicknesses and is rigid enough to withstand constant handling. Press-board guides with cut tabs or metal tips are often required in connection with loose-leaf equipment.

Guide-card stock is similar to folder stock, but of much heavier weight and greater compactness, and is used for guide-card purposes where the size or the amount of handling does not make great strength desirable.

Index-card stock is made in three standard weights in several standard qualities and in almost all colors. Small guide cards are also sometimes cut from the heavier weight and better quality card stocks.

Machine-bookkeeping stock is especially prepared, as

ordinary card stock will not meet the requirements of mechanical posting. Constant passage through the machine will leave it curled or mutilated, a thing which must be avoided if mechanical posting is to be efficient. Machine-bookkeeping stock should not be thick, highly calendered, or too stiff.

Machine-bookkeeping ledger paper should be of a high quality and of sufficient rigidity from the top to the bottom of the sheet to assure an erect position in the tray or binder while the operator is posting the accounts. It should also have a soft finish. Its greater compactness and entire freedom from any stiffness which could cause interference with the operation of a machine make its two standard weights especially desirable for ledger and statement work.

With such a variety of paper stock manufactured specially to meet the needs of particular work, the many problems of loose-leaf forms are greatly simplified. Especially is this true of the accounting-machine forms.

LOOSE-LEAF SYSTEMS

There are numerous systems which have been devised specially for loose-leaf equipment. While the binders are a very important part of loose-leaf equipment and while they play one of the chief rôles in loose-leaf systems, the forms which are used with the binders are equally important factors of the system. There are numerous distinct types of forms for practically every line of business.

The various manufacturers which put out forms for loose-leaf binders have worked out complete and very efficient systems to be used with each type of form—in fact, an entire accounting procedure for practically all of the prominent lines of business.

In accounting work the continuous billing forms as described in the previous section are of great value. Any of

various types of continuous forms may be used to great advantage.

Practically all loose-leaf systems employ the method of retaining one leaf or more to an account. By adding new leaves to each account, the original location of each account is maintained no matter how fast it grows. However, there is a bookkeeping system which differs greatly in that each sheet of the ledger is ruled to provide for several accounts.¹ In most cases the average is ten accounts to a page. The names of the accounts are placed at the left edge of the page and the lines are numbered for convenience in reference; usually every fifth line is ruled heavy, and across the top of the page, space is provided for the months of the year.

To provide for the 12 months, perforated or short pages are arranged alternately with wider account-name sheets. Under each month, space is provided for "date," "memo," "debits," "credits," and "balance." In balancing, the difference between debits and credits in each account is ascertained and noted in the "balance" column. The correctness of all of the balance extensions on a page can then be proved by a single calculation of the totals. Economy of space results from having several accounts on a page.

The total debit or credit postings for each month are readily added and compared with the original medium to prove that all charges are properly recorded and to locate errors. If difficulty is encountered in balancing, the next month's posting proceeds without inconvenience in the next month's columns. Accounts may be classified or indexed alphabetically, geographically, or by a salesman's routes.

It must not be forgotten that methods applied to ledgers cover only one of the many advantageous phases of loose-leaf systems in the modern business establishment. On every record of buying, selling, manufacturing, and administration the time- and labor-saving features of loose-leaf sys-

¹The ledger which carries this accounting system is made in two styles, solid post and sectional post, and is manufactured by such companies as John C. Moore Corporation; National Blank Book Company; Workman Manufacturing Company.

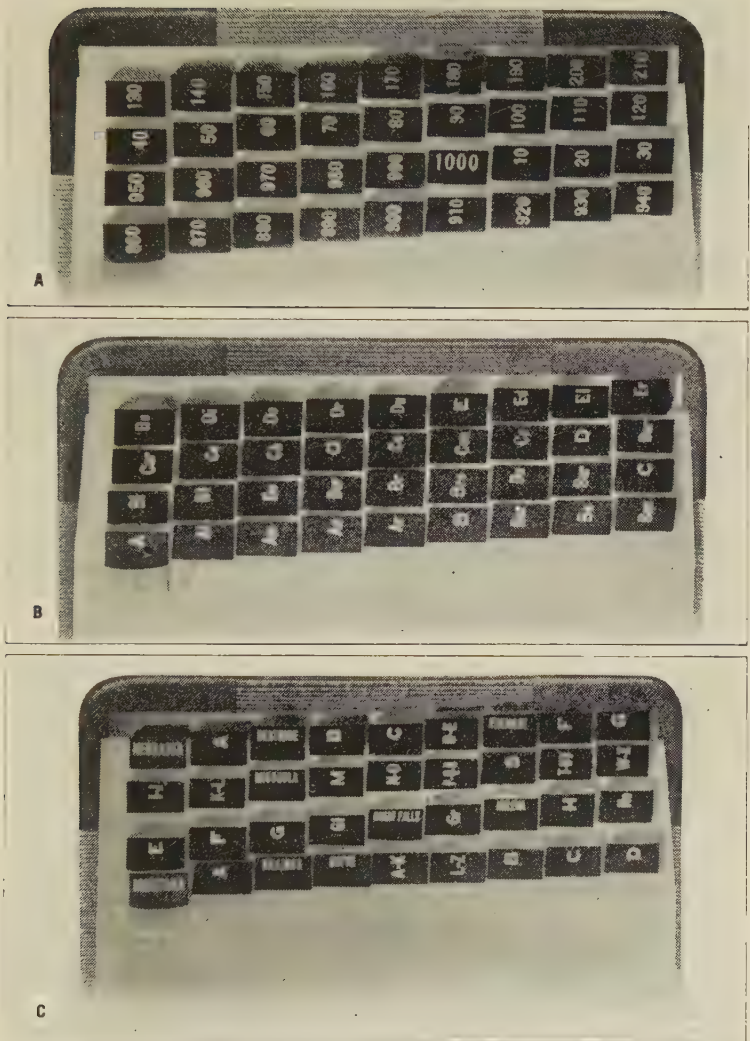


Figure 374: Three methods of indexing are here illustrated. Index A represents the numerical system. A unique method of colored tabs is often used with this system; 10 to 990 on red leather tabs, 1,000 to 5,000 on black leather tabs, and so on. Illustration B is the familiar alphabetical system, while illustration C explains the geographical method.

tems are strikingly apparent. Their ability to provide any desired working unit, to enlist the services of the printing press, of carbon-paper, and of manifolding and accounting machines makes them indispensable agents of efficiency in the creation of original records as well as in the summarizing classification, analysis, and recording of final results.

While it may be impractical to discuss even standard systems at this point, it will be well to note some uses of loose-leaf equipment and its advantages to the modern business man.

1. Loose-leaf equipment may be adapted to any business, large or small.

2. Ledgers are perpetual. New leaves may be added to each account, maintaining it in its original location no matter how rapidly it grows, the live portion being kept in the current binder and the closed portion in a transfer binder, securing a facility of inspection which cannot be obtained in an ordinary bound volume.

3. They are self-indexing. Division leaves with appropriate tabs can be distributed throughout the book or series of books; accounts can be arranged alphabetically, numerically, geographically, by routes or territories, and so forth, and the completeness and accuracy of the record established more readily than with older types of records.

4. Original records may be maintained in units which permit arrangement of posting media so that; (*a*) all items to be posted to one account may be posted at one time; (*b*) posting references become unnecessary; (*c*) work progresses naturally—no turning back and forth; (*d*) media may be resorted to facilitate statistical work of any kind; (*e*) as many copies as desired may be made at first writing (no copying), and each copy will contain complete information.

5. Records of journal type may be made to cover any period or division desired, without waste; most journalizing is eliminated without impairing record or reference.

6. Changes in division of responsibility, organization of departments, extension or contraction of sales or production

efforts, may often be made without changing system or forms.

7. The method of indexing saves time in locating accounts; less writing is necessary to make records clear; proof of correctness is more easily established; ruling off is practically eliminated; all reference is greatly facilitated.

8. Mistakes are less likely to happen. Correct accounts are more readily located with one account on the leaf; fewer figures are handled, so that the tendency for errors is greatly reduced; records may be so arranged that entries cannot be made in such a way as to throw a balance false. Predetermined group totals are easily secured.

9. It enables the assortment of doubtful and suspended accounts from current accounts; it minimizes the chances of oversight, which is apt to occur when such accounts are not segregated; it permits automatic follow-up of collections, deliveries, production, and so forth; it reduces the amount of guessing due to inconvenient reference.

10. It saves expense in material—binders will last for years and leaves only are required; it saves desk and safe room—smaller and lighter books can be used; it produces real efficiency by saving time and labor.

11. The ease with which it is possible to prepare statistics of all kinds permits the modern business man to know more about his business than ever before, and to see opportunities or be warned of dangers at the time that such knowledge is usable, instead of after it is all over.

LOOSE-LEAF INDEXING

The link which unites equipment and systems, and measures the efficiency of both, is the index.

Records are made so that one may know currently that transactions are properly handled, and so as to be able at any time to determine all the facts in regard to any transaction. This necessity of later reference makes the proper method of indexing one of the most important factors in the

successful and efficient operation of any record system.

There are five principal methods of indexing, the value of each depending upon its proper application to individual requirement. Each one is suited to a particular condition and serves well if properly applied. The five methods are numerical, alphabetic, and geographical, route or territory, and subject. As all of these methods have been previously described¹ they will be only touched upon here.

Numerical Indexing. This earliest of all methods of indexing grew out of the necessity of indexing page numbers in the days of bound-book accounting. Numerical indexing, therefore, was an inherited system and the first loose-leaf and card records were all indexed numerically. The majority of savings ledgers, building and loan records, and so forth, are maintained on this plan, and many large users maintain it on certain classes of accounts and files.

The record itself is maintained with numbered leaves, each leaf being numbered the same on both sides and containing but one account. Division leaves with tabs numbered in multiples of ten are distributed throughout the records at the proper point. Illustration A of Figure 374 represents this method.

Alphabetic Indexing. The introduction of slit-hole punching, and the unit idea (one account to the leaf) permitted perfect arrangement of ledger accounts in any desired manner, and it became apparent that if they were arranged in alphabetic (or lexical) order it would be possible to turn directly to any desired account without reference to an index; the work of creating and maintaining the index would be eliminated. Under alphabetic plans the so-called indexes are more correctly spoken of as division leaves or guides. Each division leaf bears a letter or subdivision of a letter of the alphabet, and not only are all accounts beginning with the proper letter or letters, grouped under each division leaf,

¹For a detailed account of indexing, see "Filing Methods," Chapter XXXIII.

but they are arranged in their exact alphabetical order, Abbot before Adams, and so forth (see illustration B of Figure 374).

When accounts are numerous it becomes necessary to use a closely subdivided set of alphabetical guides, but this is easily accomplished as all makers can furnish closely subdivided sets.

In many localities, and in all large lists, it is often desirable to make a tabulation of the names to be accommodated, before selecting the division tabs for the index, and to have certain tabs with surnames in full. These complete name tabs should immediately precede the alphabetic subdivision tab which most nearly coincides with the first letters of the full name tab.

Geographical Indexing. When national distribution is attained and the firm has a large number of accounts, geographical indexing is often desirable. Under this plan the major groups of accounts are arranged by states (or country). Under these state tabs, towns are arranged in alphabetic order, and under each town the customers are arranged in alphabetic order. Illustration C of Figure 374 explains how this system is carried out. If the number of customers in any one town is sufficiently large, a town name tab is used, and if the number of customers is extremely large, a set of alphabetic division leaves of proper size is placed under the name of that town.

There are many modifications of this plan. For example, a firm might have distribution throughout the Mississippi Valley, and its accounts might be of a character such that there would seldom be more than one or two in any town, and yet a geographical arrangement might be desirable. For this condition, indexing by states is often prescribed. A tab is provided for each state in which any amount of business is done. If the number of accounts in any state is large enough, an alphabetic index is placed under this state tab. The accounts are arranged in order of firm name under each

state, disregarding the town name, although it is always shown in the heading of the account.

Indexing by Route. While this method does not seem so easy, since the correspondence or other things which might require reference to an account do not always contain the information which would locate the account naturally as in an alphabetic or geographical plan, yet it is not so difficult, and in some cases is very desirable.

All orders, invoices, credit memoranda, and so forth, can readily be made to show salesman's name or route number, so that only in handling correspondence will it be difficult to get the proper key to the location of the account, and even then the address is usually sufficient indication.

A very scientific extension of this plan is widely used by public utilities. Another complete and fully developed application of it has been made by the government and is widely used by magazines. In general, however, it may be looked upon as a specialized plan, of value principally to such specialized lines as those suggested.

Subject Filing. This is another specialized plan that is very likely to arouse the interest of a growing business house. At the same time it is one of the most difficult plans to operate successfully, and the average business house is not wise to attempt to use it beyond applying it to certain specialized records, and research and investigation data.

Purchase departments find it an advantage on their buying records, stock records, and so forth. Sales departments frequently find it necessary in cataloging and on commodity analysis work. These phases of subject filing, however, are more properly known as "commodity" filing.

True subject filing is practically never applied to accounts (excepting railroads), and to those interested in its application along this line we suggest securing the desired information from the Railway Accounting Officers Association.

Division Leaves and Tabs. Since division leaves are de-

XXXIX

BILLING-MACHINE FORMS

Printed forms are used extensively. Cut forms. Continuous-length forms: roll forms; manifold forms.

AN important part of billing-machine¹ work is the printed form which is used. Forms are also extensively used for typewritten records and with loose-leaf binders. There are two general types of forms: cut forms and continuous-length forms.

CUT FORMS²

Cut forms are usually printed and padded in individual sets so that the operator tears off each set and inserts it in the machine, using loose sheets of carbon to secure the desired number of impressions. Figure 375 is a reproduction of a set of floor orders consisting of eight copies and an original. The first eight are printed on light-weight paper; the shipping department copy is printed on manila stock.

CONTINUOUS-LENGTH FORMS³

Continuous-length forms are arranged, as the name im-

—
or a complete description of billing machines read Chapter VII.

These forms are manufactured by such companies as American Loose-Leaf Manufacturing Company; American Sales Book Company, Limited; Baker Company; Charles R. Hadley Company; The Manifold Company; and the Binder Company.

Continuous-length forms are manufactured by such companies as American Sales Book Company, Limited, Autographic Register Company; Baker Company; W. S. Gilkey Printing Company; Gilman Fan-Fold Corporation, Limited; Globe Register Company; Hamilton Autographic Register Company; The Manifold Company; Standard Register Company; United Autographic Register Company.

plies, in one long strip printed in sets, so that several copies can be made in one operation. Such forms are made up in several different styles—individual rolls for each copy, “multi-ply” rolls where all copies are wound in one roll, fan-fold where the various copies of the set of forms are folded one over the other, and the several adaptations of fan-fold. Regardless of the style, the principle in all continuous forms is the same. The copies comprising the set are printed on long, unbroken strips of paper containing a thousand or more impressions of the printing plate. In practical use these forms are fed through the machine with the carbon-paper inter-

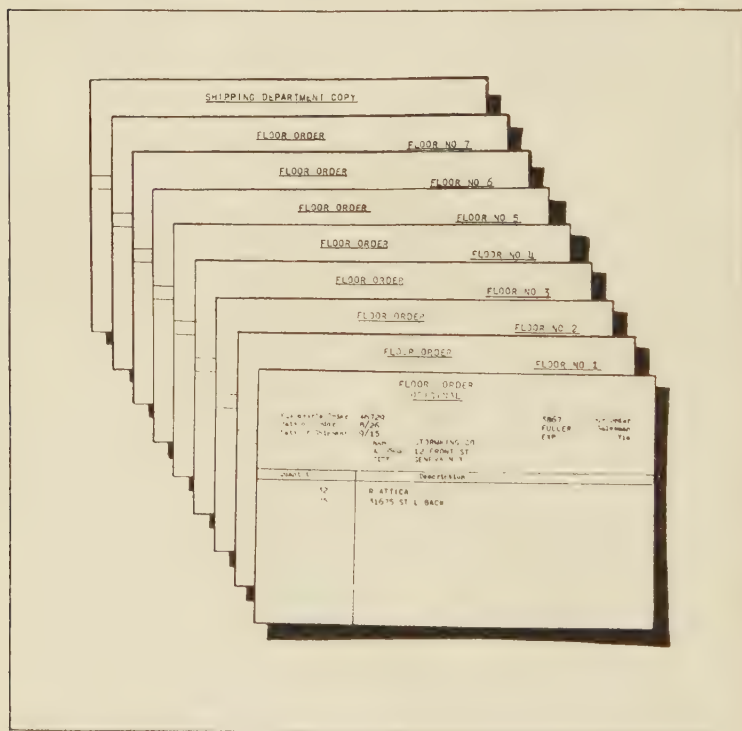


Figure 375: The set of cut forms illustrated here consists of eight copies and an original. The shipping department copy is printed on manila stock, while all other copies are printed on light-weight paper.

leaved between the copies, thus eliminating the necessity of having to insert new forms after each operation.

Roll forms. Two styles of continuous-length forms are shown in Figures 376 and 377. Each copy of a set is printed on a long strip of paper and may be wound on separate rolls. Figure 377 illustrates how the sets of forms may be wound in a single multi-ply roll. The forms can be made up to conform to the user's requirements. In fact, different colors of stock and different grades of stock can be used. The carbon-paper, in rolls approximately 75 feet in length, is fed across, between the several strips, similarly to the carbon in an automatic register.

Manifold forms. Printed continuous forms are now used

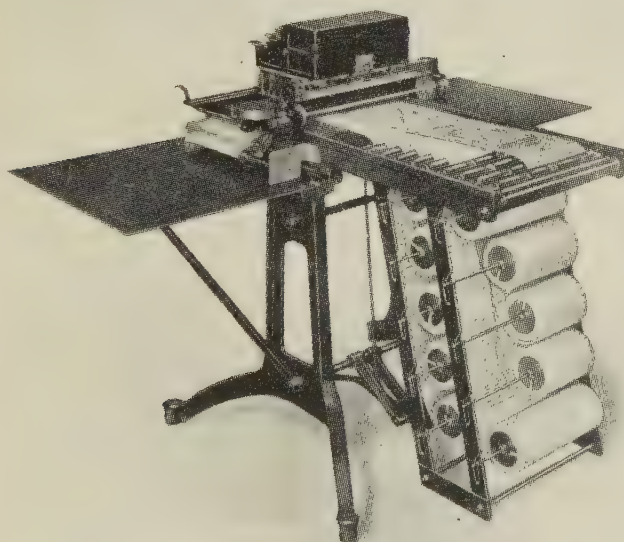


Figure 376: The roll style of continuous-length paper shown here demonstrates how it is used with a billing-machine attachment. For further details, see the section above on roll forms.

extensively for typewritten records made in manifold. These forms, known as fan-fold, superfold, or continuous interfolded, are similar, yet each has individual features which will be explained below. In general, the use of all these forms enables an operator to typewrite one set of forms after



Figure 377: Above is shown a continuous roll form which is carried in one roll. Note how the seven copies are fed into the machine. A different color of paper may be used for each copy when a signal system is desired.

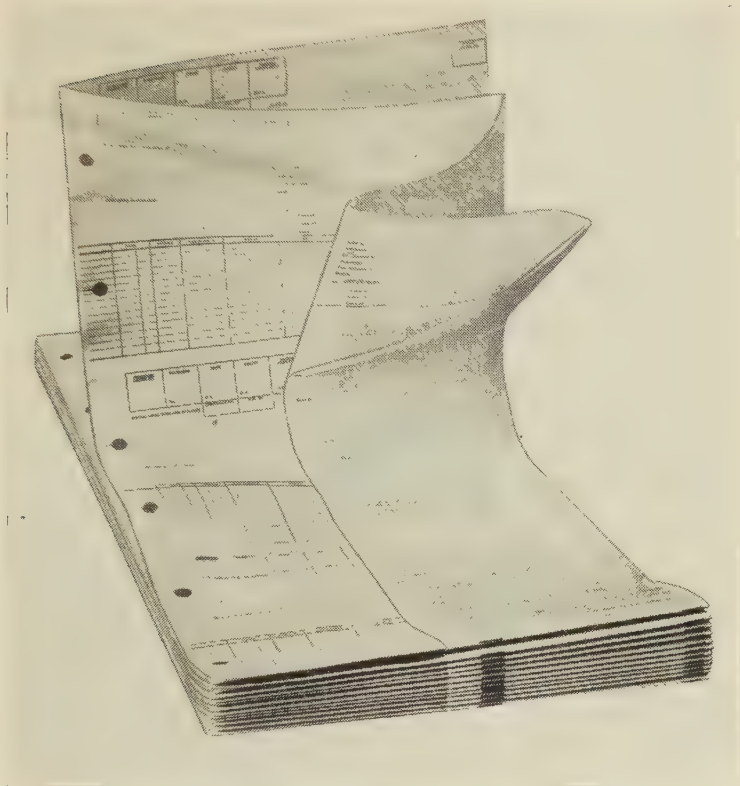


Figure 378: By using continuous forms an operator can typewrite one set of forms after another without stopping to interleave carbon-papers. The fan-fold type shown above demonstrates how the size of the parts of a set of forms can be varied to meet special requirements. See page 808 for added information.

another without stopping to interleave carbon-papers. This is accomplished by two specially constructed billing machines.¹

The so-called fan-fold forms are printed simultaneously in exact, side-to-side registration on a continuous roll of paper a mile or more in length. The width of paper depends

¹Such companies as the Elliot Fisher Company and the Underwood Typewriter Company manufacture machines of this type.

upon the width of the form and the number of parts to each set. By a special folding process this long strip of paper is fan-folded in such a manner that each part registers exactly with the original of the set. The fan-folded set then is re-folded and makes a convenient package from 17 inches to 33 inches long, containing from 1,000 to 3,000 sets, usually put in cartons, which can be placed in convenient position under the desk of the billing machine.

The type of form, as illustrated in Figure 378, can be supplied in practically any length and width and in as many parts to the set as required. Each part may be designated



Figure 379: This type of continuous forms is known variously as interfold or autofold. It is similar to the other types in that the long strips of papers are folded in zigzag packages, printed and kept in registration. A perforated line between forms acts as a hinge at the folds, and different colors of papers distinguish the forms instantly, showing also where they are to be distributed.

by a numeral, colored inks in printing, colored flags in the corners, or all three, or it may be tinted special colors to denote the use to which it is to be devoted.

Forms can be consecutively numbered in series—the same number appearing on all parts of each set. Some parts may vary in width from others. All parts of each set must be the same length, although the copies may be perforated so that a part may be detached for any purpose, either for binding or to remove information not intended for that particular part or to make any copy a special size suitable for label. Carbon can also be placed on the backs of forms upon which information must be filled in later, making it possible to make the entry on all copies in one writing without the handling of carbon-paper.

The type of form known as the superfold is very similar to the fan-fold type, except that the side folds are trimmed off, separating the different strips in a set. This makes possible the use of roll carbon without having to cut the edges of the sheets apart on the billing machines.

The tie-fold types of forms are similar to fan-fold in their manufacture, and similar to the so-called superfold in not having the forms attached at the side through their entire length; but they are fastened together at points to keep the forms in registration.

The forms known as continuous interfolded (see Figure 379) are like the superfold type in being long strips of paper folded in zigzag packages, printed and kept in registration. The continuous interfolded type differs, however, from other forms in combining different kinds, weights, and colors of paper. A clean-cut line of perforation between forms acts as a hinge at the zigzag folds, which takes the place of the fold in the paper. When the forms are separated at the perforations, they are all the same length and lie perfectly flat clear to the edge. The different colors of paper distinguish forms instantly and show where they are to go when distributed. The sides of the forms are always clean cut. This type of form can be perforated both ver-

tically and horizontally to reduce the size of the form, if desired. By using cardboard stock, a card index may be made simultaneously with the rest of the set, or a heavy sheet for hard wear, as a factory order or a repair-shop order.

Continuous-length forms free the operator from the disagreeable and time-consuming task of interleaving the carbon-paper between each copy. When one set is complete, it may be removed from the machine. At the same time a new set of forms interleaved with carbon-paper comes into place automatically. Besides saving the operator's time, continuous-length forms afford the opportunity for absolute concentration on the actual billing process.

The two types of billing machines which keep the carbons interleaved in continuous printed forms have great capacity for manifolding, making it possible to make more forms in one writing. This becomes more economical because of the automatic interleaving of carbon-paper between forms.

INDEX

INDEX

- A
- Abacus 55
- Abbott Coin Counter Co. 55
- coin-handling devices 231, 232, 240, 242
- Accounting 11, 39
- machines and devices 11-12, 14, 29, 40
- see also:*
- Billing
- Bookkeeping
- Money handling
- Office routine, functions of
- Statistics
- Accounting and tabulating machines
- equipment 168-176
- Hollerith, Dr. Herman 166
- industries using 176
- manufactured by such companies as:
- National Cash Register Co. 168
- Powers Accounting Machine Corporation 168, 173
- Tabulating Machine Co., The 168, 173, 174
- origin of 166-168
- types of 168-169
- see also* Bookkeeping machines
- Accounting Devices Co.
- loose-leaf binders 772, 774, 778, 786
- visible index systems 713
- Accounting records, equipment, and systems
- see* Loose-leaf accounting records, equipment, and systems
- Accounts, averaging 98
- Accounts payable
- analysis and recapitulation of 81
- for machines, systems, and equipment to speed up the keeping of
- see:*
- Autographic registers
- Bookkeeping machines
- File operations
- Loose-leaf accounting records, equipment, and systems
- Money handling
- Typewriters
- Accounts receivable
- analysis and recapitulation of 81
- for machines, systems, etc., that help to keep accounts up to date
- see:*
- Bookkeeping
- Billing
- File operations
- Money handling
- Recording cash and credit transactions
- Add-Index Corporation
- adding machine-cash registers 317
- adding machine-cash and credit registers 324
- adding machines 75
- credit registers 303
- finding and filing devices 721
- Adding-listing machines 57-60
- Baldwin, Frank S. 60
- early efforts to perfect 60
- see also:*
- Adding machines
- Bookkeeping machines
- Calculating machines
- Adding machine-cash registers 12, 312-321
- chief characteristics:
- adding unit, the 315
- cash drawer, the 316
- duplicate printer, the 317
- how transactions are recorded 318
- manufactured by such companies as:
- Add-Index Corporation 317
- Dalton Adding Machine Co., The 317
- Indiana Cash Drawer Co. 315, 316
- McCaskey Register Co., The 317
- Sundstrand Adding Machine Co. 317
- Wales Adding Machine Co. 317
- single printer, the 317
- see also* Adding machines
- Adding machine-cash and credit registers 322-329
- automatic combined unit type 324
- combined unit type 323
- credit file selector, the 324
- individual credit tray selector 327
- manufactured by such companies as:
- Add-Index Corporation 324
- Indiana Cash Drawer Co. 323
- International Accounting Machine Co. 324
- McCaskey Register Co., The 323
- Sundstrand Adding Machine Co. 323
- Adding machines 12, 27, 31, 40, 55, 81
- difference between, and calculating machines 57, 60
- historical background of 55-57
- manufactured by such companies as:
- Add-Index Corporation 75
- Automatic Adding Machine Co. 71
- Burroughs Adding Machine Co. 75, 77
- Calculator Company, The 71
- Dalton Adding Machine Co. 76, 77
- Erie Calculator Co. 71
- Federal Adding Machines, Inc. 75, 76, 77
- Lanston Monotype Machine Co. 75
- Peters-Morse Manufacturing Co. 75
- Pocket Adding Machine Co. 71
- Portable Adding Machine Co. 75
- Sundstrand Adding Machine Co. 76, 77
- Todd Company, The 71
- Victor Adding Machine Co. 75
- Wales Adding Machine Co. 76, 77
- patents for adding machines and for adding-machine devices obtained by:
- Baldwin, F. S. 60
- Barbour, E. D. 60
- Burroughs, W. S. 60, 61, 63
- Felt, D. E. 60, 61, 62, 63

- Gardner, C. E. 63
 Gooch, C. W. 62
 Ludlum, A. C. 60
 Neiman, F. A. 63
 Macaulay, A. 62
 McFarland 62
 Peters, H. C. 61
 Pottin, Henri 60
 Rinche, F. C. 61, 63
 Swalm, W. E. 62
 Vincent, J. G. 63
 Wetmore 62
 principles of operation 69-70
 three groups of 70
 uses of 80-81
see also:
 Bookkeeping machines
 Calculating machines
 Addressing machine 11, 12, 13, 28, 35
 attachments 412-418
 how to select the right system of 413, 419, 420
 pioneers in addressing-machine industry:
 Addressograph Co. 409, 421
 Alling, F. H. 407
 Belknap, F. D. 406
 Challenge Machine Co., The 406, 434
 Cox, Sanford C. 410
 Crane, Walter E. 407
 Duncan, Joseph S. 409
 Elliott Addressing Machine Co. 410, 429
 Elliott, Sterling 410
 Federal Addressing Co. 429
 McFatrach, James 406
 Mercantile Addressing Co. 406
 Pollard-Alling Co. 416, 421
 Rapid Addressing Machine Co. 406
 Shniedewend & Lee Co. 406
 Speedautomatic Co. 410, 421
 Typaddresser Co., The 434
 scope of their use 437, 448
 stencils 426, 429
 three methods of printing 421
see also Bookkeeping machines
 Addressograph Co.
 addressing machines 409, 421
 Administration activities 40-41
see also:
 Accounting
 Correspondence
 File operations
 Intercommunication
 Office routine, functions of
 Statistics
 "Ad"-stamper, automatic 583
 manufactured by such companies as:
 Whitaker, O. B., Manufacturing Co. 583
 Advertising, direct-mail 405
 Ajax Time Stamp Co. 521
 Alarm system, electric 567
 Alexander Sales Co.
 gelatin duplicator 386
 Allen Chair Co.
 chairs 738
 Alling, F. H.
 addressing machines 407
 All-Steel Equip Co.
 filing equipment 671
 lockers 743
 storage and supply cabinets 632
 Aluminum Company of America, The
 visible index systems 700, 711
 American Bankers Association
 numerical transit system 31
 American Desk and Stool Co.
 desks 731
 American Desk Co.
 desks 731
 American District Telegraph Co.
 electric alarm systems 567
 American Electric Co.
 copy-holders 370
 intercommunicating system 552, 564
 lighting fixtures 750
 Amberg File and Index Co.
 filing equipment 671, 676, 678
 American Institute of Filing 670
 American Loose-Leaf Manufacturing Co.
 billing-machine forms 803
 loose-leaf binders 772, 774, 779, 783
 American Multigraph Sales Co., The
 duplicating machines 379, 387, 394
 folding machines 597
 American Numbering Machine Co. 601
 American Perforator Co., The
 check cancelers 206
 check endorsers 206
 perforating machines 611
 American Sales Book Co., Ltd.
 autographic cash registers 277
 autographic registers 254, 256, 257, 258, 259
 billing-machine forms 803
 cash registers 303, 306
 Amusement parks
 coin-changing devices for 211
 Andrews, A. H., Company
 chairs 738
 Andrews Denison
 wire mesh trays 750
 Angle Steel Stool Co.
 chairs 738
 office trucks 753
 Application and value of the system-
 atization idea in business 17, 54
 Archimedes' calculator 56
 Arithmometer 86
 Art Metal Construction Co.
 bookcases 743
 chairs 738
 desks 678, 731
 filing equipment 671, 676
 safes 623
 storage and supply cabinets 632
 tables 742
 Astra Bent Wood Furniture Co.
 chairs 738
 Atlanta Table Co.
 desks 731
 Attendance-time recorders 538
 Audit, daily 310
 Aurora Metal Cabinet Works
 filing equipment 671
 Authorizing credit systems 569
 Auto-Call Co., The
 intercommunicating system 564
 Autographic cash registers 12, 274-282
 automatic type 277
 key release or plunger type 277-278
 manufactured by such companies as:
 American Sales Book Co. 277

- Egry Register Co. 277
 Globe Register Co., The 277
 Morris Register Co. 278
 Multiprint Systems Co. 277
 Standard Register Co. 277, 278
 United Autographic Register Co. 277
see also:
 Autographic registers
 Cash registers
 Autographic Register Co.
 249, 254, 256, 257, 258, 259
 billing-machine forms 803
 Autographic registers 11, 12, 13, 27, 28
 alignment, means of attaining 252
 first appearance in 1875 7
 how they developed 249
 manufactured by such companies as:
 Autographic Register Co.
 249, 256, 257, 258, 259
 American Sales Book Co., Ltd.
 254, 256, 257, 258, 259
 Egry Register Co., The 254, 256, 257
 Globe Register Co., The 254, 256, 257
 Hamilton Autographic Register
 Co., The 254, 256, 257
 Multiprint System Co., Inc., The
 254, 255, 256
 Pacific Manifolding Book Co. 256, 258, 259
 Printing Register Co. 254, 255, 256
 Standard Register Co., The
 254, 256, 257, 258, 259
 United Autographic Register Co.
 254, 256, 257, 258, 259
 Shoup, James C., inventor of 249-251
 systems 260-273
 types in use 254-260
 Automatic Adding Machine Co. 71
 Automatic Electric Co.
 intercommunicating systems 552, 564
 Automatic envelope feeder 371
 Automatic File and Index Co., The
 desks 731
 filing equipment 671, 676
 Automatic Time Stamp Co., The
 513, 518, 521
 Automatic typewriters 395
 B
 Babbage, Charles
 "calculating engine" 56
 Bacon
 calculating device 56
 Baker-Vawter Co.
 billing-machine forms 803
 filing equipment 671
 loose-leaf binders 772, 774, 779, 783
 loose-leaf ledgers 763
 Balance sheet
 preparing 81
see also Bookkeeping machines
 Baldwin, F. S.
 calculating machine 88
 Baling presses 583
 manufactured by such companies as:
 Davenport Manufacturing Co., Inc. 583
 Economy Baler Co. 583
 Famous Manufacturing Co. 583
 Galland-Henning Mfg. Co. 583
 Bank activities, classification of 26
 Bank records 665
 Banks
 application of systems, machines,
 and equipment in 24-34
 coin-changing devices for 211
 Barbee Wire and Iron Works
 wire mesh trays 750
 Barbour, E. D.
 adding-listing machines 60
 Barnes Scale Co. 504
 Barshall Equipment Co.
 safety-deposit boxes 633
 Bates Manufacturing Co., The
 eyelet fasteners 596
 numbering machines 601
 paper punches 608
 telephone indexes 613
 Beek Duplicator Co., The
 gelatin duplicators 385-387
 Belknap, F. D.
 inventor of an addressing machine 406
 Bell, Alexander Graham 542
 Bell, Chichester A.
 inventor of "graphophone" 331
 Bent, S., and Brothers
 chairs 738
 Bentley and Gerwig Furniture Co.
 desks 731
 Berger Manufacturing Co., The
 filing equipment 671
 safe 623
 storage and supply cabinets 632
 Bert Jones
 label-pasting machine 486
 Better Packages, Inc.
 envelope moisteners 595
 label moisteners 489
 sealing machines 476
 Billing 100
 simplified by tabulating machines 178, 179
see also:
 Addressing machines
 Autographic registers
 Billing machines
 Calculating machines
 Copy-holders
 Duplicating machines
 Forms
 Office routine, functions of
 Typewriters
 Billing-machine attachments
 manufactured by such companies as:
 United Autographic Register Co.
 110, 112
 803-810
 Billing-machine forms 803-810
 manufactured by such companies as:
 American Loose-Leaf Manufac-
 turing Co. 803
 American Sales Book Co., Ltd. 803
 Autographic Register Co. 803
 Baker-Vawter Co. 803
 Elliott-Fisher Co. 807
 Gilkey, W. S., Printing Co. 803
 Gilman Fan-Fold Corporation,
 Ltd. 803
 Globe Register Co. 803
 Hadley Co., Charles R. 803
 Hamilton Autographic Register Co. 803
 Manifold Co., The 803
 McBee Binder Co. 803
 Standard Register Co. 803
 Underwood Typewriter Co. 807
 United Autographic Register Co. 803

- two types:
 continuous-length forms 803
 cut forms 803
see also:
 Billing machines
 Bookkeeping machines
 Billing machines 11, 29, 102, 127
 evolution of 103-105
 list of uses for 105
 manufactured by such companies as:
 Burroughs Adding Machine Co. 116, 120
 Elliott-Fisher Co. 110, 116
 L. C. Smith & Bros. Typewriter Co., Inc. 107
 Remington Typewriter Co. 107, 114
 Underwood Typewriter Co. 107, 116
 systems 122-127
 types available 107
 versatility of the 120-121
see also:
 Billing-machine forms
 Typewriter
 Bills-of-lading 443
 Binders
 chain-post 778
 fixed-capacity 785
 loose-leaf 772
 ring and prong 786
 sectional-post 774
 solid-post 772
 telescoping-back 783
 thong 781
 tubular-post 779
see also Loose-leaf binders
Biography of John H. Patterson 286
 Bircher Co., Incorporated, The
 mailing-room equipment 453, 461
 Bird and Son, Incorporated
 floor covers 753
 Bodenstein and Kuemmerle
 chairs 738
 Bonsano, inventor of coin-handling
 device 225
 Bookcases
 manufactured by such companies as:
 Art Metal Construction Co. 743
 General Fireproofing Co., The 743
 Globe-Wernicke Co., The 743
 Gunn Furniture Co., The 743
 Library Bureau 743
 Macey Co., The 743
 Quigley Furniture Co. 743
 Shaw-Walker Manufacturing Co. 743
 Steel Equipment Corporation 743
 Weis Manufacturing Co. 743
 Yawman and Erbe Manufacturing Co. 743
 Bookkeeping
see:
 Addressing machines
 Autographic registers
 Bookkeeping machines
 Ledger-posting desks
 Loose-leaf accounting records,
 equipment, and systems
 Office routine, functions of
 Posting-machine desks
 Time-recording devices
 Typewriters
 Bookkeeping machines
 11, 27, 31, 35, 40, 128-163
 bookkeeping terms defined 131-133
 copy-holders 370
 evolved from adding machines 137
 manufactured by such companies as:
 Burroughs Adding Machine Co. 137, 147, 154
 Dalton Adding Machine Co. 137
 Elliott-Fisher Co. 147, 156
 Federal Adding Machines, Inc. 137
 National Cash Register Co., The 159
 Remington Typewriter Co. 147
 Sundstrand Adding Machine Co. 137
 Underwood Typewriter Co. 147
 posting, methods of 133-136
 proof, methods of 135-137
see also:
 Accounting and tabulating machines
 Adding machines
 Bookkeeping terms defined 131-133
 Boorum and Pease Co.
 loose-leaf binders 772-774
 "Boston" ledger
 systems 26
 the first 761
 Bradley Stencil Machine Co.
 stencil-cutting machines 490
 Brandt Automatic Cashier Co.
 coin-changing devices 212, 214, 218
 Brandt, Edward J.
 inventor of coin-changing device 212
 British Patent Office 6
 Brokers, office routine of 52
 Browne-Morse Manufacturing Co.
 chairs 738
 desks 731
 filing equipment 671, 676, 678
 tables 742
 Buffalo Desk and Table Co.
 desks 731
 Buffalo Metal Furniture Manufactur-
 ing Co.
 chairs 738
 Buffalo Scale Co. 502, 505
 Bunn, B. H. Co.
 package-tying machines 480
 Bureau of Standards of the U. S.
 Government
 specifications for safes and cabinets 623-627
 Burroughs Adding Machine Co. 75, 77
 billing machines 116, 120
 bookkeeping machines 137, 147, 154
 calculating machines 94
 calculators 88
 Burroughs, William Seward
 adding-listing machine 60, 61, 62
 Burt, William Austin
 first American typewriter patent
 granted 346
 Buying activities
 placing the order 36
 receiving and inspecting the goods 37
 recording value, quantity, and cost 37
 paying 38
see also:
 Bookkeeping
 Correspondence
 File Operations
 Money handling
 Office routine, functions of
 Statistics
 Byron Desk Co.
 desks 731
 tables 742

- C
- Cabinets
insulated, specifications for 623-627
storage and supply 632-633
Cable systems 13, 573
Cafeterias
coin-changing devices for 211
Calculagraph Co.
time-recording devices 525
Calculating devices 55, 56, 57
Calculating machine
11, 12, 27, 35, 40, 82, 101
ancestors of the 86-89
crank- and motor-driven 95-98
difference between the, and the ad-
dressing machine 57-60
how to select a
inventors:
Baldwin, F. S. 88
Burroughs 88
Felt, Dorr E. 87, 88
Marchant, R. H. 88
Odhner 88
Parmelee, D. D. 86
Pascal, Blaise 56, 86
Thomas, Charles Xavier 56, 86
key-driven 94-95
manufactured by such companies as:
Burroughs Adding Machine Co. 94
Ensign Company 95
Felt and Tarrant Manufacturing
Co. 94
Keuffel & Esser Co. 588
Marchant Calculating Machine
Co. 88, 95, 96
Monroe Calculating Machine Co.
88, 95
two types of 93-94
uses for 98-101
see also Adding machines
Calculating rules 588-590
Calculation stamps 586-588
manufactured by such companies as:
Mathews, Jas. H., Co. 586
Calculator Co., The 71
Callophone Co., of New York
intercommunicating system 552
Canton Art Metal Co., The
chairs 738
desks 731
filing equipment 671, 676, 678
safe 623
storage and supply cabinets 632
Canton School Supply Co.
office blackboards 753
Card cabinets 676
Card files 29, 665
Card filing guides 692
Card-index system 27, 665
see also Filing equipment
Card ledgers 666
Card-record desks and supplies
676-678, 692-695
Card records 665
Carriers
cable 573
wire-line 572
Cary Safe Co.
safes 623
safety-deposit boxes 633
storage and supply cabinets 632
Cash and credit transactions 12
see also Recording cash and credit
transactions
Cash balance, daily 80
Cash books, adding and balancing 98, 99
Cash disbursements
see:
Bookkeeping
File Operations
Money handling
Office routine, functions of
Recording cash and credit trans-
actions
Cash expenditures, petty 81
Cash receipts
see:
Bookkeeping
File Operations
Money handling
Office routine, functions of
Recording cash and credit trans-
actions
Cash records
see:
Buying activities
Selling activities
Cash registers 11, 12
characteristics of modern 286-289
classification of
non-printing type 293
printing type 294
development of 284-286
manufactured by such companies as:
Federal Cash Register Co. 293
National Cash Register Co., The
293, 294, 295, 296, 297
Patterson, John H. 286
Remington Cash Register Co.,
Inc., subsidiary of Remington
Arms Co., Inc. 295
Ritty, Jacob 284
St. Louis Cash Register Co., Inc. 293
see also:
Autographic cash registers
Autographic registers
Cash sales records 328
Cashier's department 99
Central filing system 668
see also File operations
Central Manufacturing Co.
desks 731
tables 742
Chairs 738-742
manufactured by such companies as:
Allen Chair Co. 738
Andrews, A. H., Co. 738
Angle Steel Stool Co. 738
Art Metal Construction Co. 738
Astra Bent Wood Furniture Co. 738
Bent, S. and Brothers 738
Bodenstein and Kuemmerle 738
Browne-Morse Manufacturing Co. 738
Buffalo Metal Furniture Manu-
facturing Co. 738
Canton Art Metal Co. 738
Chicago Wire Chair Co. 738
Claus, A., Manufacturing Co. 738
Cleveland Fixture Co. 738
Cleveland Seating Co. 738
Closterman, H. 738
Colonial Chair Co. 738
Columbus Aseptic Furniture Co. 738
Conrades Manufacturing Co. 738
Cook, C. A., Co. 738

- Cook Furniture and Equipment Co. 738
- Crocker Chair Co. 738
- Crown Chair Co. 738
- Culler Furniture Co. 738
- Cutler Desk Co. 738
- Davis Chair Co. 738
- De Frehn, W., and Sons 738
- Delaware Chair Co. 738
- Derby, C., and Co. 738
- Domore Chair Co. 738
- Duane Chair Co. 738
- Dunn, John A., Co. 738
- Ehlers, Robert J., Co. 738
- Fort Smith Chair Co. 738
- Globe-Wernicke Co., The 738
- Grand Ledge Chair Co. 738
- Gunlocke, W. H., Chair Co. 738
- Hale Company 738
- Hartwig and Kemper 738
- Harvey Chair Co. 738
- Herhold Chair Co. 738
- Heywood-Wakefield Co. 738
- Horrocks Desk Co. 738
- Jasper Chair Co. 738
- Johnson Chair Co. 738
- Kalamazoo Steel Goods Co. 738
- Karpen, S., and Brothers 738
- Kohn, Jacob and Josef 738
- Langslow Fowler Co. 738
- Logeman Manufacturing Co. 738
- Macey Company, The 738
- Manufacturing Equipment and Engineering Co. 738
- Marble, B. L., Chair Co. 738
- Marble and Shattuck Chair Co. 738
- Marietta Chair Co. 738
- Miller, John, and Co. 738
- Milwaukee Chair Co. 738
- Murphy Chair Co., Inc. 738
- Nichols and Stone 738
- Noecker, H. L., and Son 738
- Northwestern Furniture Co. 738
- Ott, L. W., Manufacturing Co. 738
- Phoenix Chair Co. 738
- Pierce, S. K., and Son Co. 738
- Poughkeepsie Chair Co. 738
- Renfro-Wodenstein Desk Co. 738
- Retting Furniture Co. 738
- Rossell Brothers and Co. 738
- Royal Metal Manufacturing Co. 738
- Sheboygan Chair Co. 738
- Sikes Company, The 738
- Sikes Consolidated Chair Co. 738
- Southern Chair Co. 738
- Standard School Equipment Co. 738
- Stow and Davis Furniture Co. 738
- Suitt Brothers Manufacturing Co. 738
- Superior Furniture Co. 738
- Temple-Stuart Co. 738
- Thonet Brothers 738
- Tonk Manufacturing Co. 738
- Union City Chair Co. 738
- Van Meter Chair Co. 738
- Wagemaker Co. 738
- Webster Manufacturing Co. 738
- Welch, W. M., Scientific Co. 738
- Challenge Machinery Co., The
addressing machines 406, 434
paper-cutting machines 605
paper punches 608
- Champion Register Co., The
- credit registers 303, 304, 306
- Charge accounts 309, 322
- see also:*
Autographic registers
Credit authorization system
Credit registers
Recording cash and credit trans-
actions
- Charge sales records
see Charge accounts
- Chatillon, John, and Sons
scales 498, 502, 504, 505
- Check cancelers 206-208
manufactured by such companies as:
American Perforator Co., The 206
Cummins Perforator Co. 206
- Check certifiers 11, 202
manufactured by such companies as:
Joslin Manufacturing Co., A. D. 202
Roberts Numbering Machine Co. 202
- Check endorsers 11, 204
manufactured by such companies as:
American Perforator Co., The 206
Cummins Perforator Co. 206
The International Postal Supply
Co. of New York 206
quantity feed endorsers 206
single feed endorsers 206
- Check protectors and writers 11, 28, 180-201
- check paper 189
early 182-190
manufactured by such companies as:
Checkometer Sales Co. 189, 190, 191
Defiance Manufacturing Cor-
poration 191, 193
Hall-Welter Co., Inc. 191, 192, 196
Hedman Manufacturing Co. 189, 190, 191, 194, 196
Safe-Guard Check Writer Co.,
Inc. 189, 190, 191, 195, 196
Todd Co., The 189, 190, 191, 196, 197, 200
- special features:
amount and payee's name pro-
tector 191
diagonal-amount-line check writer 195
foreign-language check writer 196
general utility protector 193
numeral imprint and payee pro-
tector 194
personal check protector 200
removable-type protector 192
two-color amount-line check writer 197
- Checkometer Sales Co.
check protectors and writers 189, 190, 191
- Checks
listing outstanding 81
totaling 99
"Cheque," first mention of 188
Chicago Mirror and Art Glass Co.
glass desk tops and glass trays 747, 750
Chicago Wire Chair Co.
chairs 738
Chinese swanpan 55
Chrysostom
use of shorthand 331
- Cicero
use of shorthand 331
- Cincinnati Time Recorder Co., The 518, 520, 522, 536
- Circularizing 12, 15

- see also*:
- Addressing machines
 - Duplicating machines
 - Envelope feeders
 - Envelope sealing machines
 - Folding machines
 - Mailing-room equipment
 - Permit, meter, and precanceled stamp systems and machines
 - Scales
 - Sealing machines
 - Stamp affixers
- Classification of business from the angle of the system idea 23, 24
- Classification of office machines and devices 10
- Claus, A., Manufacturing Co. chairs 738
- Clemetson Company desks 731 tables 742
- Cleveland Fixture Co. chairs 738
- Cleveland Seating Co. chairs 738
- Clocks *see* Time clocks
- Closterman, H. chairs 738
- Clute, George F., Manufacturing Co. coin-changing devices 212, 214, 220
- Coin-changing devices 11, 28, 211-223 features of modern 212 how and where used 221-224 inventors: Brandt, Ed. J. 212 Staats, Wm. H. 212 manufactured by such companies as: Brandt Automatic Cashier Co. 212, 214, 218 Clute, Geo. F., Manufacturing Co. 212, 214 Electric Change Machine Co. 212, 214, 215 Hedman Manufacturing Co. 212, 214, 215, 218 Hoefer Change Maker Co. 212, 214, 215, 218 types on the market 214, 221
- Coin-counters and separators 242-244 *see also* Coin-handling devices
- Coin-counting and packaging machines 11, 232-242 *see also* Coin-handling devices
- Coin-handling devices 224-247 classified as to function 227 coin-counters and separators 242 coin-counting and packaging machines 232 coin separators 231 early stages of 225 manufactured by such companies as: Abbott Coin Counter Co. 231, 232, 240, 242 Automatic Coin Wrapping Machine Co. 236 Downey Co., The C. L. 231, 232, 236, 239, 240, 242, 243 Jorgensen Manufacturing Co. 231, 232, 239, 240 Sattley Co., The 231, 232, 236, 239, 240, 243 Standard-Johnson Co. 231, 232, 239, 240, 243
- Coin separators *see also* Coin-handling devices
- Coin sorters, counters and wrappers 28 *see also* Coin-handling devices
- Collections 43, 444
- Collection sheets 446
- Colonial Chair Co. chairs 738
- Columbia Steel Equipment Co. filing equipment 671, 676, 678
- Columbus Aseptic Furniture Co. chairs 738
- Commercial Furniture Co. desks 731 tables 742
- Commercial institutions application of systems, machines, and equipment in 34-42 Commissions, computing 80, 99 "Comptograph" 63
- Conant, Charles A. 181
- Conrades Manufacturing Co. chairs 738
- Contract records 717
- Cook, C. A., Co. chairs 738
- Cook Furniture and Equipment Co. chairs 738
- Cooper-Hewitt Electric Machine Co. photo-copying machine lamps 400
- Copy-holders 366-371 *see also* Typing aids
- Corona Typewriter Co. 362
- Correspondence *see*: Addressing machines Circularizing Copy-holders Dictating machines Mailing-room equipment Scales
- Corry-Jamestown Manufacturing Corporation filing equipment 671
- Cosby-Werth Manifold Book Co. credit registers 303
- Cost accounting 540
- Cost and statistical department 99
- Cost records 443, 717
- Costs figuring, with tabulating machines 179 prorating 100 *see also*: Job costs Piece costs Production costs Selling costs
- Counting machines 590 manufactured by such companies as: Tickometer Co., The 590
- County offices *see* Municipal, county and state offices
- Coupon-printing machines manufactured by such companies as: Tabulating Machine Co., The 590
- Cox, Sanford Co. inventor of an addressing machine 410
- Crane, Walter E. inventor of an addressing machine 407
- Credit accounts *see* Charge accounts

- Credit and collection records 665, 668
see also Recording cash and credit transactions
- Credit authorization systems 13, 569
 visible files 717
- Credit files 324
see also File operations
- Credit records 668
see also:
 Bookkeeping
 File Operations
 Recording cash and credit transactions
- Credit registers 300-311
 daily-account type 303
 daily past-account type 308
 manufactured by such companies as:
 Add-Index Corporation 303
 American Sales Book Co., Ltd. 303-306
 Champion Register Co., The 303, 304, 306
 Cosby-Werth Manifold Book Co. 303
 McCaskey Register Co., The 301, 303, 306
 National Cash Register Co., The 308
 Reliable System Co., The 303
 United Autographic Register Co. 303
 the first credit registers 301
- Credit sales 328
see also Credit records
- Crocker Chair Co.
 chairs 738
- Crown Chair Co.
 chairs 738
- Crowther, Samuel
Biography of John H. Patterson 286
- Culler Furniture Co.
 chairs 738
- Cummins Perforator Co.
 check cancelers 206
 check endorser 206
 perforating machines 610
- Customers' records 717
- Cutler Desk Co.
 chairs 738
 desks 731
 tables 742
- D
- Dalton Adding Machine Co., The 76, 77
 adding machine-cash register 317
 bookkeeping machines 137
 Dating stamps 13
- Davenport Manufacturing Co., Inc.
 baling presses 583
- Davis Chair Co.
 chairs 738
- Dayton Scale Co. 498, 504
- Dealers' lists 44
- Defiance Manufacturing Corporation
 check protectors and writers 191, 193
- De Frehn, W., & Sons 738
- Delaware Chair Co.
 chairs 738
- Demountable Typewriter Co. 354, 359
- Densmore, James 7, 350
- Dentists' records 665
- Deposit items, handling
see Banks
- Deposit slips and checks 80, 98, 99
see also Banks
- Derby, C., and Co.
 chairs 738
- Desks
 card-record 676, 677
 ledger 678-679
 office 731-737
 manufactured by such companies as:
 American Desk Co. 731
 American Desk and Stool Co. 731
 Art Metal Construction Co. 731
 Atlanta Table Co. 731
 Automatic File and Index Co. 731
 Bentley and Gerwic Furniture Co. 731
 Browne-Morse Co. 731
 Buffalo Desk and Table Co. 731
 Byron Desk Co. 731
 Canton Art Metal Co., The 731
 Central Manufacturing Co. 731
 Clemetsen Co. 731
 Commercial Furniture Co. 731
 Cutler Desk Co. 731
 Dietz, J. F., Co. 731
 Doten-Dunton Desk Co. 731
 Durand Desk Co. 731
 Edwards, O. M., Co. 731
 Englewood Desk Co. 731
 Evansville Desk Co. 731
 Excello Products Corp. 731
 Franklin Manufacturing Co. 731
 General Fireproofing Co. 731
 Globe-Wernicke Co., The 731
 Gunn Furniture Co., The 731
 Hoosier Desk Co. 731
 Horrocks Desk Co. 731
 Imperial Desk Co. 731
 Jasper Desk Co., The 731
 Jasper Novelty Co. 731
 Jasper Office Furniture Co. 731
 Leopold Desk Co. 731
 Library Bureau 731
 Macey Company, The 731
 Marysville Cabinet Co. 731
 Metal Office Furniture Co. 731
 Minneapolis Office and School Furniture Co. 731
 Montgomery Table and Desk Works 731
 Myrtle Desk Co. 731
 National Desk Co. 731
 Olsen, O. C. S., Co. 731
 Orpin Desk Co. 731
 Quigley Furniture Co., The 731
 Shaw-Walker Co. 731
 Shelbyville Desk Co. 731
 Smith Wayne Co., Inc. 731
 Southern Desk and Table Co. 731
 Standard Furniture Co. 731
 Steel Equipment Corporation 731
 Steel Fixture Manufacturing Co., The 731
 Stow and Davis Furniture Co. 731
 Tell City Desk Co. 731
 Valley City Desk Co. 731
 Van Dorn Iron Works Co. 731
 Wagemaker Co. 731
 Watson Manufacturing Co. 731
 Western Furniture Co. 731
 Yawman and Erbe Manufacturing Co. 731
- Desk tops or pads 746
- Desk trays 676, 748
- Detex Watchclock Corporation 535

- Devices
see Office devices
- Diagraph Stencil Machine Co.
stencil-cutting machine 490
- Dick Company, A. B.
stencil duplicators 378, 382
- Dickens, Charles
use of shorthand 331
- Dictaphone Sales Corporation
dictating machines 334, 345
- Dictating machines 12, 330-345
advantages of the 342
creating a system:
cylinder shaving department 338
dictator's system 340
time and record keeping 340
transcribing department 338
early history of 331
manufactured by such companies as:
Dictaphone Sales Corporation 334, 345
Ediphone Division, Thomas A. Edison, Inc. 334, 345
three units:
dictating machine 334
shaving machine 335
transcribing machine 336
- Dictograph Products Corporation
intercommunicating system 552
- Diebold Safe and Lock Co.
safes 623
safety-deposit boxes 633
storage and supply cabinets 632
vaults 628
- Dietz, J. F., Co.
desks 731
- Direct-Line Telephone Co.
intercommunicating system 552
- Direct-mail advertising 405, 439
- "Direct Method," the 20
- Disbursement records
see:
Bookkeeping
File Operations
Recording cash and credit transactions
- Disbursements 446
summary of daily 80
- Discounts
figuring 80, 100
proving 99
- Distribution of sales 81, 98, 100, 717
- Ditto, Incorporated
gelatin duplicators 386
- Dividends 448
- Doctors' records
see Professions
- Domore Chair Co.
chairs 738
- Door lock, recording 528-531
- Doten-Dunton Desk Co.
desks 731
- Downey Co., The C. L.
coin-handling devices 231, 232, 239, 240, 242, 243
- Duane Chair Co.
chairs 738
- Duncan, J. S.
inventor of an addressing machine 409
- Dunn, John A., Co.
chairs 738
- Duplicating machines 11, 12, 13, 374-398
- automatic typewriters 395
clay composition duplicators 387
first stencil duplicator 378
five kinds of 382
gelatin duplicators 385
manufactured by such companies as:
Alexander Sales Co. 386
American Duplicator Co., The 386
American Multigraph Sales Co., The 379, 387, 394
Beck Duplicator Co., The 386
Dick Co., A. B. 378, 382
Ditto, Incorporated 386
Duplico Manufacturing Co. 386, 387
Graphic Duplicator Co. 378, 386
Heyer Duplicator Co., Inc. 382, 386, 387
Hooven Automatic Typewriter Corporation 395
Individualizing Co., of Illinois 387
Lisenby Manufacturing Co. 379, 394
Multistamp Co., Inc. 385
National Duplicator Co. 387
Rotospeed Company 382
Underwood Typewriter Co. 382
United States Duplicator Co. 386
mimeograph, A. B. Dick, the 378
multigraph, the 379
stencil duplicators 382
typewriter type 387
Duplico Manufacturing Co.
gelatin duplicator 386, 387
Durand Desk Co.
desks 731
- E
- Earnings and expense, operating statement of 81
- Economy Baler Co.
baling presses 583
- Ediphone Division, Thomas A. Edison, Inc.
dictating machine 334, 345
- Edison, Thomas A.
inventor of phonograph 331
- Edwards, O. M., Co.
desks 731
- Egry Register Co., The
autographic cash register 277
autographic registers 254, 256, 257
- Ehlers, Robert J., Co.
chairs 738
- Elapsed-time recorders 41, 525-528
see also Time recorders
- Electric alarm systems 567
- Electric Change Machine Co.
coin-changing devices 212, 214, 215
- Electric credit authorization systems 13, 569
- Electric paging systems 13, 562-565
- Electric Seal Co., The
wax sealing machines 479
- Elliott Addressing Machine Co. 410, 429
- Elliott-Fisher Co.
billing-machine forms 807
billing machines 110, 116
bookkeeping machines 147, 156
- Elliott, Sterling
inventor of an addressing machine 410
- Ellis Time Stamp Co., The 521
- Emmert Manufacturing Co., Inc.
sealing machines 476
- Employees' time recorders 518-520

see also Time-recording devices

Englewood Desk Co.

desks 731

tables 742

Ensign Company

calculating machine 95

Envelope feeder, automatic 12, 371

Envelope moisteners

manufactured by such companies as:

Better Packages, Inc. 595

Envelope openers, mechanical 453

Envelope-sealing machines 12, 459

Envelopes

see Pay Envelopes

Erie Calculator Co. 71

Error-No, Incorporated

copy-holders 366

Estimates, figuring 80, 99

Evansville Desk Co.

desks 731

Excello Products Corporation

desks 731

Exchange, meeting the problem of 29

see also Banks

Exchange records

see:

Autographic registers

File Operations

Loose-leaf accounting, equipment,
and systems

Expense records 81

see also:

Bookkeeping

Recording cash and credit trans-
actions

Expense reports, proving travelers' 81

Express companies

see Railroad, Steamship, and express
companies

Extensions, figuring and proving 99, 100

Eyelet fasteners

manufactured by such companies as:

Bates Manufacturing Co., The 596

F

Factory reports 665

Factory routings 449

Fairbanks, E. and T., and Co.

scales 502, 505

Famous Manufacturing Co.

baling presses 583

Faries Manufacturing Co.

lighting fixtures 750

Federal Adding Machines, Inc. 75, 76, 77

bookkeeping machines 137

Federal Addressing Co. 429

Federal Cash Register Co. 293

Federal offices 54

Federal Telephone Manufacturing Co.

intercommunicating system 552

Felt, Dorr E.

adding-listing machine 60, 61, 62

calculating machine 87, 88

Felt and Tarrant Manufacturing Co.

calculating machines 94

Felt "Comptograph" 63

File operations

see:

Filing equipment

Filing methods

Finding and filing devices

Visible index systems

File operators 670

Filing equipment 13, 40, 671-695

arch and board files 683-685

card cabinets and desk trays 676

card-record desks 676

card-record supplies 692-695

combination files 676

filing cabinets 672-676

ledger desks 678-679

ledger trays 680-682

manufactured by such companies as:

All-Steel Equip Co. 671

Amberg File and Index Co.

671, 676, 678

Art Metal Construction Co.

671, 676, 678

Aurora Metal Cabinet Works 671

Automatic File and Index Co.,

The 671, 676

Baker-Vawter Co. 671

Berger Manufacturing Co., The 671

Browne-Morse Co. 671, 676, 778

Canton Art Metal Co., The

671, 676, 678

Columbia Steel Equipment Co.

671, 676, 678

Corry-Jamestown Manufacturing

Corporation 671

General Fireproofing Co., The

671, 676, 678

Globe-Wernicke Co., The 671, 676, 678

Invincible Metal Furniture Co. 671

Library Bureau 671, 676, 678

Macey Company, The 671, 676

Metal Office Furniture Co. 671

Safe Cabinet Co., The 671

Shaw-Walker Co. 671, 676, 678

Steel Equipment Corporation 671

Van Dorn Iron Works Co., The

671, 676, 678

Wagemaker Company 671, 676

Watson Manufacturing Co.

671, 676, 678

Weis Manufacturing Co. 671

Yawman and Erbe Manufacturing

Co. 671, 676, 678

steel storage shelving 682-683

supplies for paper filing 685-692

transfer cases 682

see also Filing methods

Filing methods 639-670

card records 665

central filing system, planning 668

five basic methods: 642

alphabetic 646-649

chronological 658-659

geographical 651-653

numerical 649-651

subject 653-658

follow-up systems 659

geographical filing 651

numerical filing 649

transferring 661

Filing schools 670

Filing sections 29

Filing system, central 668

Financial reports

see Balance sheets

Findex Company, The

finding and filing devices 724

Finding and filing devices 13, 719-728

- manufactured by such companies as:
 - Add-Index Corporation 721
 - Findex Company, The 724
 - Lederman System, Inc. 722
- three methods of collecting data 721-724
- Finnell System, Inc.
 - floor-scrubbing and polishing machines 596
- Floor covers 753
- Floor-scrubbing and polishing machines
 - manufactured by such companies as:
 - Finnell System, Inc. 596
- Folders, filing 688
- Folding machines 12, 597
 - manufactured by such companies as:
 - American Multigraph Sales Co., The 597
 - Liberty Folder Co., The 597
 - Nelson, C. R. and W. A., Inc. 597
- Follett Time Recording Co. 518, 521, 522
- Follow-ups 665
- Force, William A., and Co., Inc.
 - numbering machines 601
- Foreign exchange, figuring 99
- Forms
 - as an element of system 23
 - cut and loose-leaf 11
 - manifold
 - see Duplicating machines
 - printed 803
 - see also:
 - Billing-machine forms
 - Loose-leaf accounting records, equipment and systems
- Forms and records
 - used by:
 - banks 24-34
 - brokers 52-53
 - commercial institutions 48-50
 - hotels and clubs 46-48
 - institutions 48-50
 - insurance companies 53
 - professions 51-52
 - public service corporations 42-46
 - see also Records
- Fort Smith Chair Co.
 - chairs 738
- Fractional quantities, adding 100
- Freight allowances, deducting 100
- Freight bills, figuring and proving 98, 100
- Functional classification of office machines and devices 10-16
- Functions of office routine
 - see Office routine, functions of
- Franklin Manufacturing Co.
 - desks 731
- Furniture 13
 - see also Office furniture
- G
- Gammeter, Harry C.
 - multigraph machine 379
- Galland-Henning Manufacturing Co.
 - baling presses 583
- Gardner, Clyde E.
 - adding-machine carriage 63
- Gas, electric, and water companies, routine activities of, classified 43
- Gathright, Joseph B.
 - typewriter tabulating device 352
- Gelatin duplicators 385
- General Fireproofing Co.
 - bookcases 743
 - desks 731
 - filing equipment 671, 676, 678
 - lockers 743
 - safe 623
 - safety-deposit boxes 633
 - storage and supply cabinets 632
 - tables 742
- Gerbert
 - calculating device 56
- Gilkey, W. S., Printing Co.
 - billing-machine forms 803
- Gisholt Machine Co.
 - time-recording devices 522
- Glidden, Carlos
 - typewriter inventor 349-350
- Globe Register Co., The
 - autographic cash registers 277
 - autographic registers 254, 256, 257
 - billing-machine forms 803
- Globe-Wernicke Co., The
 - bookcases 743
 - chairs 738
 - desks 731
 - filing equipment 671, 676, 678
 - safes 623
 - storage and supply cabinets 632
 - tables 742
 - visible index systems 700, 713
- Golding Manufacturing Co.
 - paper-cutting machines 604
- Gooch, C. W.
 - adding machine, split keyboard 62
- Gorin, F. P.
 - typewriter decimal tabulator 353
- Graff-Underwood Co.
 - pencil-sharpeners 752
- Grand Ledge Chair Co.
 - chairs 738
- Graphic Duplicator Co.
 - duplicating machine 378
 - gelatin duplicator 386
- Graphophone
 - invented by:
 - Bell, Chichester A. 331
 - Tainter, Charles Sumner 331
- Gunlocke, W. H., Chair Co.
 - chairs 738
- Gunn Furniture Co., The
 - bookcases 743
 - desks 731
 - tables 742
- Gutenberg 6
- H
- Hadley Co., Charles R.
 - billing-machine forms 803
 - loose-leaf binders 772, 774, 779
- Hale Company
 - chairs 738
- Hall's Safe Co., The
 - safes 623
 - safety-deposit boxes 633
- Hall-Welter Co., Inc.
 - check protectors and writers 191, 192, 196
- Hamilton Autographic Register Co.
 - autographic registers 254, 256, 257
 - billing-machine forms 803

- Hammond, James B.
typewriter inventor 351, 362
Hammond Typewriter Corp. 351, 362
Handwriting transmitting machines 13, 570, 571
Hanson Brothers Scale Co. 498, 505
Hart & Hutchinson Co., The
lockers 743
storage and supply cabinets 632
Hartwig and Kemper
chairs 738
Harvey Chair Co.
chairs 738
Hectograph process and duplicating
machines 8
Hedman Manufacturing Co.
check protectors and writers 189, 190, 191, 194, 196
coin-changing devices 212, 214, 215, 218
Heinn Company
loose-leaf binders 779, 783, 786
Herhold Chair Co.
chairs 738
Herring-Hall-Marvin Safe Co.
safes 623
safety-deposit boxes 633
vaults 628
Heyer Duplicator Co., Inc. 382, 386, 387
Heywood-Wakefield Co.
chairs 738
Historical background of office ma-
chines, equipment, and systems 4
Hoban Receiver Holder Corporation
intercommunicating system 564
Hoefer Change Maker Co.
coin-changing devices 212, 214, 215, 218
Hollerith, Dr. Herman
tabulating machine 166
Holtzer-Cabot Electric Co., The
intercommunicating systems 552, 564
Hoosier Desk Co.
desks 731
tables 742
Hooven Automatic Typewriter Cor-
poration 395
Horrocks Desk Co.
chairs 738
desks 731
Horton typewriter 352
Hospital records 665
see also Institutions
Hotels and clubs
application of systems, machines
and equipment in 46-48
House organs 441
see also Duplicating machines
Howard, E., Clock Co., The
time-recording devices 519, 520, 532, 536
Howe Scale Co. 502, 505
Hunting, H. R., Co., The
loose-leaf binders 772, 774, 779, 783, 786
- I
- Ideal Stencil Machine Co.
stencil-cutting machine 490
Imperial Desk Co.
desks 731
Imprinting presses
manufactured by such companies as:
Golding Manufacturing Co. 599
Improved Office Partition Co.
adjustable office partitions 753
- Indexing
loose-leaf
alphabetic indexing 798
division leaves and tabs 800
geographical indexing 799
numerical indexing 798
route indexing 800
subject filing 800
see also Filing equipment; Filing
methods; Visible index systems,
Indexing reference data 439
see also File operation
Indiana Cash Drawer Co.
adding machine—cash registers 315, 316
adding machine—cash and credit
registers 323
Individualizing Co., of Illinois
duplicating machines 387
Industrial revolution, the 4
Inkswells 747
Institutions
application of systems, machines,
and equipment in 48-50
Insurance companies
office routine activities of 53
Insurance premium, notices and re-
ceipts 444
Insurance records 665
Intercommunicating systems 13, 16, 541-582
authorizing credit systems 569
electric paging system 564-567
manufactured by such companies as:
American Electric Co. 552, 563
Auto-Call Co., The 564
Automatic Electric Co. 552, 564
Callophone Co. of New York 552
Dictograph Products Corporation 552
Direct Line Telephone Co. 552
Federal Telephone Manufacturing
Co. 552
Hoban Receiver Holder Corpora-
tion 564
Holtzer-Cabot Electric Co., The
552, 563
Kellogg Switchboard and Supply
Co. 551
Lamson Company, The 571
Morkrum-Kleinschmidt Corp. 568
National Cash Register Co., The 569
Signal Electric Manufacturing Co. 564
Stromberg-Carlson Telephone
Manufacturing Co. 551, 552
Telautograph Corporation 570
Western Electric Manufacturing
Co. 564
mechanical messengers
cable carriers 573
pneumatic tube system 574, 575
wire-line carriers 571-572
purpose of 547
scope of 579
telautograph system 570-571
teletype typewriter 568
telephone 551
automatic 552
manual 552-562
telephone attachments 562-564
Intercommunication
see:
Cable system
Duplicating machines

- Electric credit authorizing systems
 Electric paging systems
 Handwriting transmitting machines
 Pneumatic tubes
 Telegraph typewriters
 Telephone credit systems
 Typewriters
 Wire carriers
 Interest, figuring 99
 International Accounting Machine Co.
 adding machine-cash and credit registers 324
 International Postal Supply Co. of New York
 check endorsers 206
 mailing room equipment 468-469
 International Time Recording Co. 514,
 518, 519, 520, 521, 522, 525, 532, 536
 Inventories
 extending and adding 81, 99
 perpetual 282, 442, 717
 tabulating machines for taking 177
 see also Stock records
 Inventory records
 see:
 Autographic registers
 Calculating machines
 Loose-leaf accounting records, equipment, and systems
 Statistics
 Tabulating machines
 Typewriters
 Invincible Metal Furniture Co.
 safety-deposit boxes 633
 Invincible Metal Manufacturing Co.
 filing equipment 671
 Invoice extension, figuring original 100
 Invoices
 checking 80
 proving extensions and discounts 99
 tabulating machines for 178
 Irving-Pitt Manufacturing Co.
 loose-leaf binders 772, 774, 783, 785-786
- J
- Jasper Chair Co.
 chairs 738
 Jasper Desk Co., The
 desks 731
 Jasper Novelty Co.
 desks 731
 Jasper Office Furniture Co.
 desks 731
 Job costs, figuring 99
 see also Job-time recorders
 Job-time recorders 41, 522
 see also:
 Time recorders
 Time-recording devices
 Johnson Chair Co.
 chairs 738
 Johnson, J. M. 225
 Johnston, William G., Co.
 loose-leaf binders 772, 774, 783
 Jorgensen Manufacturing Co.
 coin-handling devices 231, 232, 239, 240
 Joslin Manufacturing Co., A. D.
 check certifiers 202
 time-recording devices 521
- K
- Kalamazoo Loose Leaf Binder Co.
 loose-leaf binders 767, 772, 774, 781, 785, 788
 loose-leaf ledgers 767
 paper-cutting machines 604
 paper punches 608
 Kalamazoo Steel Goods Co.
 chairs 738
 Kardex Rand Co.
 visible index systems 700, 705
 Karpen, S., and Brothers
 chairs 738
 Kellogg Switchboard and Supply Co.
 intercommunicating systems 551
 Keuffel & Esser Co.
 calculating rules 588
 Keyless Lock Co.
 safety-deposit boxes 633
 Kohn, Jacob and Josef
 chairs 738
 "Ktypographic" machine 348
- L
- Label moisteners 489
 manufactured by such companies as:
 Better Packages, Incorporated 489
 Label-pasting machines 13, 486
 manufactured by such companies as:
 Bert Jones 486
 Potdevin Machine Co. 486
 Labor costs, tabulating machine for figuring 179
 see also Job-time recorders
 Labor distribution, summaries of 81
 see also Labor costs
 Lamson Co., The
 intercommunicating system 571
 Langslow Fowler Co.
 chairs 738
 Lanston Monotype Machine Co.
 adding machines 75
 Laundry routings 448
 Lawyers' records
 see Professions
 Lederman System, Incorporated
 finding and filing devices 722
 Ledger
 "Boston" 761
 bound-book 759
 card 761
 Ledger accounts 98
 footing 81
 Ledger balance, daily 80
 Ledger desks 28, 678-679
 see also Loose-leaf accounting records, etc.
 Ledger posting desks 80
 see also Desks
 Ledger sheets 446
 Ledger trays 28, 680-682
 see also Loose-leaf accounting records, etc.
 Lefebure Ledger Co.
 loose-leaf binders 772, 774, 783
 Leibnitz
 calculating machine 56
 Leopold Desk Co.
 desks 731
 Letter openers

- see:*
 Envelope openers
 Mailing-room equipment
- Letters
 dictating
see Dictating machines
 duplicating
see Duplicating machines
 filing
see File operations
 transcribing
see Transcribing devices
- Liberty Folder Co., The
 folding machines 597
- Library Bureau
 bookcases 743
 desks 731
 filing equipment 671, 676, 678
 safes 623
 tables 742
 visible index systems 700, 705
 Lighting fixtures 750
- Line-A-Time Manufacturing Co., The
 copy-holders 366, 370
- Lisenby Manufacturing Co.
 duplicating machines 379
- Lists
see Mailing lists
- Loan and discount activities 28
see also Banks
- Lock, recording door 514, 528-531
- Lockers 743-745
 manufactured by such companies as:
 All-Steel Equip. Co. 743
 General Fireproofing Co., The 743
 Hart & Hutchinson Co., The 743
 Lyon Metallic Manufacturing Co. 743
 Manufacturing Equipment and Engineering Co. 743
 Terrell's Equipment Co. 743
- Logeman Manufacturing Co.
 chairs 738
- Loose-leaf accounting records, equipment, and systems 28, 35, 754-802
 advantages of 769-771
 binders 25, 772-786
 evolution of 754-757
 ledgers 759-767
 paper 788
- Loose-leaf binders
 manufactured by such companies as:
 Accounting Devices Co. 772, 774, 778, 786
 American Loose-Leaf Manufacturing Co. 772, 774, 779, 783
 Baker-Vauter Co. 772, 774, 779, 783
 Boorum and Pease Co. 772, 774
 Dameron-Pierson Co., Ltd. 772, 774
 Hadley, Charles R., Co. 772, 774, 779
 Heinn Company 774, 779, 783, 786
 Hunting Co., The H. R. 772, 774, 779, 783, 786
 Irving-Pitt Manufacturing Co. 772, 774, 783, 785, 786
 Johnston, William G., Co. 772, 774, 783
 Kalamazoo Loose Leaf Binder Co. 767, 772, 774, 781, 785, 788
 Lefebure Ledger Co. 772, 774, 783
 McBee Binder Co. 772, 774, 779, 783, 786
 McDonald Ledger & Loose Leaf Co. 774, 783
- McMillan Book Co. 772, 774, 785, 786
 Mann, William, Co. 772, 774, 779, 783, 786
 Miller, H. C., Co. 772, 774, 778, 783, 786
 Moore, John C., Corporation 772, 774, 783, 785, 794
 National Blank Book Co. 772, 774, 783, 786, 794
 Proudfit Loose-Leaf Co. 772, 774, 781
 Richmond and Backus Co., The 772, 774, 779, 783
 Sieber Products Manufacturing Co. 781
 Stationers Loose-Leaf Co. 772, 774, 783, 786
 Steel Back File and Ledger Co. 772, 774
 Stephens, Hugh, Manufacturing Co. 772, 774
 Tallman, Robbins and Co. 772, 774, 783
 Tatum, Samuel C., Co. 772, 774, 783, 786
 Tenacity Manufacturing Co., The 772, 774, 783, 786
 Tengwall Company 772, 774, 786
 Trussell Manufacturing Co. 786
 Wilson Jones Loose Leaf Co. 772, 774, 783, 786
 Workman Manufacturing Co. 772, 774, 786, 794
- see also:*
 Loose-leaf accounting records, equipment, and systems
 Binders
 Loose-leaf devices
see:
 Loose-leaf accounting records, equipment, and systems
 Loose-leaf binders
 Loose-leaf indexing
 Loose-leaf ledger
 Loose-leaf systems
 Loose-leaf indexing 797-802
 Loose-leaf ledger
 first practical 763
 manufactured by such companies as:
 Baker-Vawter Co. 763
 Kalamazoo Loose Leaf Binder Co. 767
 Loose-leaf systems 11, 12, 25, 793-797
 Ludlum, A. C. 60
 adding-listing machine
 Lyon Metallic Manufacturing Co. 743
 lockers 632
 storage and supply cabinets 742
 tables
- M
- MacCaulay, A.
 symbol-printing device 62
- McBee Binder Co.
 billing-machine forms 803
 loose-leaf binders 772, 774, 779, 783, 786
 McCaskey Register Co., The
 adding machine-cash registers 317
 adding machine-cash and credit registers 323
 credit registers 301, 303, 306
 safes 623
- McDonald Ledger and Loose-Leaf Co.
 loose-leaf binders 783

INDEX

827

- McFarland
 - adding-machine release key 62
- McFatrigh, James
 - inventor of an addressing machine 406
- McMillan Book Co.
 - loose-leaf binders 772, 774, 785, 786
- Macey Company, The
 - bookcases 743
 - chairs 738
 - desks 731
 - filing equipment 671, 676
 - safes 623
 - tables 742
- Machine posting
 - see also Bookkeeping machines
- Machine-posting equipment
 - see also Loose-leaf accounting rec-ords, etc. 28, 32
- Machine production
 - see Production activities
- Machine-production forms
 - see also Loose-leaf accounting rec-ords, etc. 42
- Magazine routings 449
- Magnus
 - calculating device 56
- Mahlstedt, John F.
 - multicolor press 379
- Mailing lists 665
 - see also Circularizing
- Mailing-room equipment
 - combined sealing and stamping ma-chine 451-474
 - envelope openers, mechanical 453
 - hand stamp affixers 454
 - manufactured by such companies as:
 - Bircher Co., Inc., The 453, 461
 - International Postal Supply Co. of New York 468, 469
 - Multipost Company 454, 458, 461
 - O. K. Manufacturing Co. 453
 - Postage Meter Co., The 461, 463, 468, 471
 - Reynolds Envelope Sealer Co. 462
 - Sealograph Company 462
 - Standard Mailing Machine Co. 454, 459, 469
- parcel-post machines
 - permit, meter, and pre-canceled stamp systems 463
 - sealing machines 459
- Manifold Company, The
 - billing-machine forms 803
- Mann, William, Co.
 - loose-leaf binders 772, 774, 779, 783, 786
- Manufacturing Equipment and Engi-neering Co.
 - chairs 738
 - lockers 743
 - storage and supply cabinets 632
- Marble, B. L., Chair Co.
 - chairs 738
- Marble and Shattuck Chair Co.
 - chairs 738
- Marchant Calculating Machine Co.
 - 88, 95, 96
- Marchant, R. H.
 - calculating machine 88
- Marietta Chair Co.
 - chairs 738
- Marketing 439
- Marsh Stencil Machine Co.
 - stencil-cutting machines 490
- Marshall, *Readings in Industrial His-tory* 4
- Marysville Cabinet Co.
 - desks 731
- Material and supplies, computing state-ment of 81
- Material record forms 42
 - see also Loose-leaf accounting rec-ords, etc.
- Mathews, James H., and Co.
 - calculation stamps 586
 - receipting-coupon cutters 612
- Mechanical messengers
 - cable carriers 573
 - pneumatic tube systems 574, 575, 577
 - wire-line carriers 571
- Meilink Steel Safe Co., The
 - safes 623
- Mercantile Addressing Co.
 - addressing machines 406
- Merchandise summaries 81
- Messengers, mechanical 571
- Metal Office Furniture Co.
 - desks 731
 - filing equipment 671
 - safes 623
 - storage and supply cabinets 632
 - tables 742
- Metal Specialties Manufacturing Co.
 - sealing machines 476
- Method, as an element in system 23
- Miller, H. C.
 - originator of early loose-leaf ledger 763
- Miller, H. C., Co.
 - loose-leaf binders 772, 774, 778, 783, 786
- Miller, John, and Co.
 - chairs 738
- Miller Safe Co.
 - safe 623
- Mills, Henry
 - granted a typewriter machine patent in 1714 6, 346
- Milwaukee Chair Co.
 - chairs 738
- Mimeograph, A. B. Dick, The
 - 378
- Minneapolis Office and School Furni-ture Co.
 - desks 731
- Miscellaneous office appliances 583-614
 - automatic "ad"-stamps 583
 - baling presses 583
 - calculating rules 588-590
 - calculation stamps 586
 - counting machines 590
 - coupon-printing machines 590-595
 - envelope moisteners 595-596
 - eyelet fasteners 596
 - floor-scrubbing and polishing ma-chines 596-597
 - folding machines 597-599
 - imprinting presses 599-601
 - multiple stamps 601
 - numbering machines 601-604
 - paper-cutting machines 605-608
 - paper punches 608
 - perforating machines 610
 - receipting-coupon cutters 612
 - telephone indexes 613
 - ticket-marking machines 613

- Office procedure and efficiency, emphasized 2
- Office records 441
- Office routine, four functions of 35, 42
- administration 46
- see also Administration activities
- buying 36
- see also Buying activities
- production 41
- see also Production activities
- selling 38
- see also Selling activities
- Office systems
- classification of office machines and 9-16
- Office trucks 753
- O. K. Manufacturing Co.
- mailing-room equipment 453
- Oliver Typewriter Co. 367
- Olsen, O. C. S., Co.
- desks 731
- tables 742
- Order-filing
- see File operations
- Order-writing 38, 43
- Organization, as an element of system 22
- Orpin Desk Co.
- desks 731
- tables 742
- Ott, L. W., Manufacturing Co.
- chairs 738
- P
- Pacific Manifold Book Co.
- autographic registers 256, 258, 259
- Package-tying machines 13, 480, 486
- manufactured by such companies as:
- Bunn, B. H. C. 480
- National Bundle Tyer Co. 480
- Paging systems
- see Electric paging systems
- Pako Corporation
- photo-copying machine dryers 403
- Paper 755, 788, 802
- Paper-cutting machines 13, 605
- manufactured by such companies as:
- Challenge Machinery Co., The 604
- Golding Manufacturing Co. 604
- Kalamazoo Loose Leaf Binder Co. 604
- Pavyer Printing Machine Works 604
- Paper filing, supplies for 685, 695
- Paper mills, early 755
- Paper punches 13, 608
- manufactured by such companies as:
- Bates Manufacturing Co., The 608
- Challenge Machinery Co., The 608
- Kalamazoo Loose Leaf Binder Co. 608
- Nelson, C. R. and W. A., Co. 608
- Proudfit Loose Leaf Co. 608
- Papyrus 754
- Parcel-post machines 13, 458
- Parcel-Post System 494
- Parchment 754
- Parmelee, D. D.
- calculating machines 86
- Pascal, Blaise
- calculating machine 56, 86
- Patterson, John H.
- cash register 286
- Pavyer Printing Machine Works
- paper-cutting machine 605
- Pay envelopes, making out 81
- Pay-roll
- accounting 540
- coin-changing devices for 211
- compiling change sheet for 81
- preparing 81
- records 538, 665
- Pay-roll forms 42
- see also Loose-leaf accounting records
- Pay-sheets 447
- Paging systems, electric 564-567
- Peerless calculator 56
- Peerless Light Co.
- lighting fixtures 750
- Pencil sharpeners 752
- Pepys, early use of shorthand 331
- Perforating machines 12, 13, 611
- manufactured by such companies as:
- American Perforator Co. 611
- Cummins Perforator Co. 611
- Rosback, F. P., Co. 611
- Permit machines 12
- Permit, meter, and precanceled stamp systems 463
- Perpetual inventory
- see Inventory
- Perpetual inventory forms 42
- see also Loose-leaf accounting records, etc.
- Perpetual inventory records, posting 80
- see also Stock records
- Personnel, a factor in system 22
- Personnel forms 42
- see also Loose-leaf accounting records, etc.
- Peters, H. C.
- non-adding machine 61
- Peters-Morse Manufacturing Co.
- adding machine 75
- Petty cash expenditures, handling 81
- Phelps Guardant Time Lock Co. 514, 528
- Phinney, Z. 495
- Phoenix Chair Co. 738
- Phonograph
- Thomas A. Edison 331
- Photo-copying machines
- manufactured by such companies as:
- Photostat Corporation 400
- Rectigraph Company 400
- auxiliary equipment 403
- lamps 403
- manufactured by such companies as:
- Cooper-Hewitt Electric Machines 403
- dryers 403
- manufactured by such companies as:
- Pako Corporation 403
- Photostat Corporation
- photo-copying machines 400
- Physicians' records 665
- Piece costs, figuring 99
- Pierce, S. K., and Son Co.
- chairs 738
- Pike adding-listing machine 62, 63
- Pneumatic tube systems 13, 574-578
- Pocket Adding Machine Co. 71
- Pollard-Alling Company
- addressing machines 407, 421
- Portable Adding Machine Co. 75
- Portable typewriters 362

Postage Meter Co., The
 sealing machines 461, 468, 471
 Postal scales 498-504
 Postindex Company, Inc.
 visible index systems 700, 704, 711, 713
 Posting-machine desks 11, 28, 32
see also Desks
 Postings
 daily 80
 proving 99
 Post-office routings 449
 Pottin, Henri
 adding-listing machine 60
 Potdevin Machine Co.
 label-pasting machine 486
 Poughkeepsie Chair Co. 738
 Powers Accounting Machine Corpora-
 tion
 accounting and tabulating machines 168, 175
 Powers, James
 tabulating machine 167
 Precanceled stamp system 12, 463
 Premises, as an element of system 23
 Printing Register Co.
 autographic register 254, 255, 256
 Production activities 41
see:
 Bookkeeping
 Calculating machines
 File operations
 Intercommunication
 Paper-cutting machines
 Perforating machines
 Tabulating machines
 Time-recording devices
 Shipping-room aids
 Production, and office routine 41-42
 Production cost, computing statement
 of 81
 Production records
see:
 Autographic registers
 Calculating machines
 Forms
 Loose-leaf accounting records,
 equipment, and systems
 Statistics
 Time-recording devices
 Typewriters
 Professions
 systems, machines, and equipment
 in various 50-52
 Profit and loss statement, compiling 81
 Profits, figuring, by salesman, depart-
 ment, etc. 100
 Program instruments 536-537
 Projean, Xavier
 typewriter inventor, 1833 348
 Proudfit Loose Leaf Co.
 loose-leaf binders 772, 774, 781
 paper punches 608
 Public service corporations
 system, machines, and equipment
 in 42-46
 Purchase ledgers, visible index system 717
 Purchase records 665, 717
see also:
 Buying activities
 Recording cash and credit trans-
 actions
 Statistics

Quigley Furniture Co.
 bookcases 743
 desks 731
 tables 742
 R
 Railroad, steamship, and express com-
 panies
 records and forms used by 45
 Railroads, coin-changing devices for 211
 Rapid Addressing Machine Co. 406, 427
 Real estate and rental offices 446
 Real estate records 665
 Receipting-coupon cutters
 manufactured by such companies as:
 Mathews, Jas. H., and Co. 612
 Receipts, itemized 80, 320
 Recorders, time
see Time recorders
 Recording cash and credit transactions
see also:
 Adding machine - cash registers
 Adding machines
 Autographic cash registers
 Cash registers
 Loose-leaf devices
 Recording Devices Co.
 time-recording devices 528
 Recording door lock 514, 528, 531
see also Time-recording devices
 Record-keeping 320, 329
 Records
 and system in business 22
 bank 665
 card 665
 contract 717
 cost 443, 717
 credit and collection 665, 668
 customers' 717
 dentists' and doctors' 665
 expense 81
 hospital 665
 insurance 665
 office 441
 pay-roll 665
 physicians' 665
 purchase 665, 717
 real estate 665
 safe-keeping 615-638
 sales 328, 665, 667
 stock 442, 443, 665, 667, 717
 systems for various 665
 wage 717
see also Forms and records
 Rectograph Company
 photo-copying machine 399
 Reliable Safe and Lock Co.
 safes 623
 safety-deposit boxes 633
 Reliable System Co., The
 credit registers 303
 Remington and Sherman Co.
 vaults 628
 Remington, E., and Sons 351
 Remington Cash Register Co., Inc.
 subsidiary of Remington Arms Co.,
 Inc. 295
 Remington Noiseless Typewriter Cor-
 poration 359
 Remington Typewriter Co.
 billing machines 107, 114

- bookkeeping machines 147
- typewriters 351, 352, 354, 362
- Remittances, adding 98
- Renfro-Wodenstein Desk Co.
 - chairs 738
- Retting Furniture Co.
 - chairs 738
- Reynolds Envelope Sealer Co. 462
- Richmond and Backus Co., The
 - loose-leaf binders 772, 774, 779, 783
- Ritty, James
 - cash register inventor 284
- Rinche, Frank C.
 - adding-listing machine 61, 63
- Roberts Numbering Machine Co., The
 - check certifiers 202
- Roman abacus 58
- Rosback, F. P., Co.
 - perforating machines 611
- Ross-Gould Co.
 - visible index systems 700, 710, 713
- Rotospeed Company
 - stencil duplicators 382
- Routine as a factor in system 23
 - see also* Office routine, functions of
- Routing 448
- Royal Typewriter Co. 354
- Ryan, J. F., and Co.
 - sealing machines 476
- S
- Safe-deposit activities 33
 - see also* Banks
- Safe-Cabinet Co., The
 - filing equipment 671
 - safes 623
 - storage and supply cabinets 632
- Safe-Guard Check Writer Co., The
 - check protectors and writers 189, 190, 191, 195, 196
- Safe-keeping records 615-638
 - Bureau of Standards of the U. S. Government
 - specifications for safes and cabinets 623-627
 - general specifications for safes 624-627
 - National Fire Protective Association, The
 - three fundamental hazards 617-618
 - Underwriters Laboratories, Inc., The 622
 - value of the record 618-623
 - vault protection 627-632
- Safe Seal Manufacturing Co.
 - wax sealing machines 479
- Safes 615
 - classification of 622-623
 - general specifications for 624-627
 - manufactured or jobbed by such companies as:
 - Art Metal Construction Co. 623
 - Berger Manufacturing Co., The 623
 - Canton Art Metal Co., The 623
 - Cary Safe Company 623
 - Diebold Safe and Lock Co. 623
 - General Fireproofing Co., The 623
 - Globe-Wernicke Co., The 623
 - Hall's Safe Co., The 623
 - Herring-Hall-Marvin Safe Co. 623
 - Library Bureau 623
 - Macey Co., The 623
 - McCaskey Register Co., The 623
 - Meilink Steel Safe Co., The 623
 - Metal Office Furniture Co. 623
 - Miller Safe Co. 623
 - Mosler Safe Co. 623
 - National Safe and Lock Co., The 623
 - Reliable Safe and Lock Co. 623
 - Safe Cabinet Co., The 623
 - Schwab Safe Co., The 623
 - Shaw-Walker Co. 623
 - Steel Equipment Corporation 623
 - Stiffel-Freeman Safe Co. 623
 - Syracuse Safe Co. 623
 - Van Dorn Iron Works Co., The 623
 - Victor Safe and Lock Co. 623
 - Yawman and Erbe Manufacturing Co. 623
 - York Safe and Lock Co. 623
 - "Truth about Testing Safes, The" 622
- Safety-deposit boxes 616
 - manufactured by such companies as:
 - Barshall Equipment Co. 633
 - Cary Safe Co. 633
 - Diebold Safe and Lock Co., The 633
 - General Fireproofing Co., The 633
 - Hall's Safe Co., The 633
 - Herring-Hall-Marvin Safe Co. 633
 - Invincible Metal Furniture Co. 633
 - Keyless Lock Co. 633
 - Mosler Safe and Lock Co., The 633
 - National Safe and Lock Co., The 633
 - Reliable Safe and Lock Co., The 633
 - Remington and Sherman Co. 633
 - Schwab Safe Co., The 633
 - Steel Equipment Corporation 633
 - Stiffel-Freeman Safe Co. 633
 - York Safe Co. 633
- Sales
 - analysis and statistics 717
 - daily recapitulation of 80
 - distribution of
 - by departments, etc. 81, 717
 - from charge slips 98
 - figuring, by salesman, etc. 100
 - Sales ledger, visible index system 717
 - Sales promotion, visible index system 717
 - Sales records 328, 665, 667, 694
 - Sales reports, tabulating machines 179
 - Sales sheets, daily, adding 98
 - Sales summaries 81
 - St. Louis Cash Register Co., Inc. 293
 - Sanitariums
 - see* Institutions
 - Sattley Co., The
 - coin-handling devices
 - 231, 232, 236, 239, 240, 243
- Saxonia "automatic calculator" 56
- Scales 494-509
 - heavy-capacity 506
 - manufactured by such companies as:
 - Barnes Scale Co. 504
 - Buffalo Scale Co. 502, 505
 - Chatillon, John, & Son 498, 502, 504, 505
 - Dayton Scale Co. 498, 504
 - Fairbanks, E. and T., and Co. 502, 505
 - Hanson Brothers Scale Co. 498, 505
 - Howe Scale Co. 502, 505
 - Standard Computing Scale Co. 504
 - Stimpson Computing Scale Co. 504
 - Strait Scale Co. 505
 - Toledo Scale Co. 498, 502, 504, 505

- | | | | |
|---|---------------|---|-----------------|
| Triner Scale and Manufacturing Co. | 498, 502, 505 | <i>see also:</i> | |
| merchandise | 504, 506 | Addressing machines | |
| pendulum | 495 | Autographic registers | |
| postal | 498, 502 | Label-pasting machines | |
| Scheduling | 444 | Package-tying machines | |
| Schniederwend and Lee Co. | | Parcel post-machines | |
| addressing machines | 406 | Sealing machines | |
| Schools | | Shipping-room aids | |
| <i>see</i> Institutions | | Stamp affixer | |
| Schwab Safe Co., The | | Stencil-cutting machines | |
| safe | 623 | Tape sealing machines | |
| safety-deposit boxes | 633 | Wax sealing machines | |
| storage and supply cabinets | 632 | Shipping-room aids | 475-493 |
| Schwalbach, Mathias | 7 | label-moisteners | 489 |
| Screw Machine Products Corporation, The | | label-pasting machines | 486 |
| intercommunicating systems | 552 | package-tying machines | 480-486 |
| Sealing machines | 13, 459 | sealing machines | |
| manufactured by such companies as: | | tape | 475 |
| Better Packages, Inc. | 476 | wax | 479 |
| Electric Seal Co., The | 479 | stencil-cutting machines | 490 |
| Emmert Manufacturing Co., Inc. | 476 | Sholes, Christopher Latham | |
| Metal Specialties Manufacturing Co. | 476 | typewriter inventor | 6, 349-350 |
| Nashua Package Sealing Co., Inc. | 476 | Shop orders | 441 |
| Ryan, J. F. and Co. | 476 | Shorthand | 330, 331 |
| Safe Seal Manufacturing Co. | 479 | Shoup, James C. | |
| Van Horn, V. J., Co. | 476 | inventor of autographic registers | 249-251 |
| tape | 475 | Signal Electric Manufacturing Co. | |
| wax | 479 | intercommunicating systems | 564 |
| Sealograph Co. | | Signature Company, The | 208 |
| envelope-sealing machines | 462 | Signature devices | 12, 208, 209 |
| Selling activities | | Sikes Co., The | |
| accounting | 39 | chairs | 738 |
| billing | 39 | Sikes Consolidated Chair Co. | |
| order-writing | 38 | chairs | 738 |
| shipping | 39 | Silent Watchman Corporation, The | |
| <i>see also:</i> | | time-recording devices | 528 |
| Billing | | Simplex Time Recorder Co. | 518 |
| Bookkeeping | | Slide-rules | 11, 12, 588-590 |
| Circularizing | | Smith & Bros., L. C., Typewriter Co. Inc. | 354, 357 |
| Correspondence | | billing machine | 107 |
| File operations | | Smith, Burgess | |
| Intercommunication | | check paper | 189 |
| Money handling | | Smith Premier Typewriter Co. | 354 |
| Office routine, functions of | | Smith Wayne Co., Inc. | |
| Recording cash and credit trans- | | desks | 731 |
| actions | | Soule, Samuel W. | 6 |
| Shipping | | typewriter inventor | 349-350 |
| Statistics | | Southern Chair Co. | 738 |
| Selling costs, figuring | 100 | Southern Desk and Table Co. | |
| Selling, Edward | | desks | 731 |
| adding-machine keyboard | 62 | tables | 742 |
| Sengbusch Self-Closing Inkstand Co. | 747 | Speedautomatic Company | |
| Seth Thomas clock | 513 | addressing machines | 410, 421 |
| Shaw-Walker Co. | | Speed-o-Feeder Sales Co., The | |
| bookcases | 743 | automatic envelope feeder | 371 |
| desks | 731 | Staats, William H. | |
| filing equipment | 671, 676, 678 | inventor of first coin-changing device | 212 |
| storage and supply cabinets | 632 | Stamp affixers | 12, 13, 454 |
| Sheboygan Chair Co. | | Stamping machine | 463 |
| chairs | 738 | Stamplex Corporation | |
| Shelbyville Desk Co. | | multiple stamps | 601 |
| desks | 731 | Stamps, calculation | 586 |
| tables | 742 | Standard Computing Scale Co. | 504 |
| Shelving, steel storage | 682-683 | Standard Furniture Co. | |
| Shipments | 443 | desks | 731 |
| Shipping | 13, 39, 43 | Standard-Johnson Co. | |
| | | 231, 232, 239, 240, 243 | |
| | | Standard Mailing Machines Co. | |
| | | 454, 459, 469 | |

- Standard Register Co., The
 autographic cash registers 277, 278
 autographic registers 254, 256, 257, 258, 259
 billing-machine forms 803
 Standard School Equipment Co.
 chairs 738
 State offices
see Municipal, county, and state
 offices
 Statements 444, 448
 monthly 81, 98
 of operating expense and earnings 81
 Stationers Loose Leaf Co.
 loose-leaf binders 772, 774, 783, 786
 Statistical statements 51
 Statistics
see:
 Adding machines
 Calculating machines
 Loose-leaf devices
 Slide-rules
 Tabulating machines
 Typewriters
 Steamship companies
see Railroad, steamship, and express
 companies
 Steel Back File and Ledger Co.
 loose-leaf binders 772, 774
 Steel Equipment Corporation
 bookcases 743
 desks 731
 filing equipment 671
 safes 623
 safety-deposit boxes 633
 storage and supply cabinets 632
 tables 742
 Steel Fixtures Manufacturing Co., The
 desks 731
 tables 742
 Steel storage shelving 682-683
 Stencil-cutting machines 490
 manufactured by such companies as:
 Bradley Stencil Machine Co. 490
 Diagraph Stencil Machine
 Corporation 490
 Ideal Stencil Machine Co. 490
 Marsh Stencil Machine Co. 490
 Stencil duplicator 378
 Stephens, Hugh, Manufacturing Co.
 loose-leaf binders 772, 774
 Stiffel-Freeman Safe Co.
 safes 623
 safety-deposit boxes 633
 storage and supply cabinets 632
 Stimpson Computing Scale Co. 504
 Stock-keeping
 tabulating machines for 177
 Stock records 442, 443, 665, 667, 694, 717
see also:
 Autographic registers
 Calculating machines
 Loose-leaf accounting records
 equipment, and system
 Statistics
 Typewriters
 Stop-payment register 717
 Storage and supply cabinets 632-633
 manufactured by such companies as:
 All-Steel Equip Co. 632
 Art Metal Construction Co. 632
 Berger Manufacturing Co. 632
 Canton Art Metal Co., The 632
 Cary Safe Co. 632
 Diebold Safe and Lock Co. 632
 General Fireproofing Co., The 632
 Globe-Wernicke Co., The 632
 Hart & Hutchinson Co., The 632
 Lyon Metallic Manufacturing
 Co. 632
 Manufacturing Equipment and
 Engineering Co. 632
 Metal Office Furniture Co. 632
 National Safe and Lock Co., The 632
 Safe Cabinet Co., The 632
 Schwab Safe Co., The 632
 Shaw-Walker Co. 632
 Steel Equipment Corporation 632
 Stiffel-Freeman Safe Co. 632
 Terrell's Equipment Co. 632
 Victor Safe and Lock Co. 632
 Yawman and Erbe Manufacturing
 Co. 632
 Stow and Davis Furniture Co.
 chairs 738
 desks 731
 tables 742
 Strait Scale Co. 505
 Stromberg-Carlson Telephone Manu-
 facturing Co.
 intercommunicating systems 551, 552
 Stromberg Electric Co.
 time-recording devices 518, 520, 525, 532, 536
 Suitt Brothers Manufacturing Co.
 chairs 738
 Sundstrand Adding Machine Co. 76, 77
 adding machine-cash and credit
 registers 323
 adding machine-cash registers 317
 bookkeeping machines 137
 Superior Furniture Co.
 chairs 738
 Swalm, William E.
 adding-machine totalizer 63
 Swanpan 55
 Symbol-printing devices 62
 Synchronized time systems 13
see also Time-recording devices
 Syracuse Safe Co. 623
 Systematization
 the seven elements of 21-24
 what is systematization? 20-21
 System idea
 application of the, to:
 banks 24-34
 commercial institutions 34-41
 public service corporations 42-46
 hotels and clubs 46-48
 professions 50-52
 institutions 48-50
 T
 Tables 742
 manufactured by such companies as:
 Art Metal Construction Co. 742
 Browne-Morse Company 742
 Byron Desk Co. 742
 Central Manufacturing Co. 742
 Clemetsen Company 742
 Commercial Furniture Co. 742
 Cutler Desk Co. 742
 Englewood Desk Co. 742
 General Fireproofing Co., The 742

- Globe-Wernicke Co., The 742
 Gunn Furniture Co., The 742
 Hoosier Desk Co. 742
 Library Bureau 742
 Lyon Metallic Manufacturing Co. 742
 Macey Company, The 742
 Metal Office Furniture Co. 742
 Olsen, O. C. S., Company 742
 Orpin Desk Co. 742
 Quigley Furniture Company 742
 Shelbyville Desk Co. 742
 Southern Desk and Table Co. 742
 Steel Equipment Corporation 742
 Steel Fixture Manufacturing Co. 742
 Stow and Davis Furniture Co. 742
 Watson Manufacturing Co. 742
 Yawman and Erbe Manufacturing Co. 742
 Tabulating machines 35, 41
see also Accounting and tabulating machines
 Tabulating Machine Co., The
 accounting and tabulating machines 168, 173, 174
 coupon-printing machine 590
 Tainter, Charles Sumner
 inventor of graphophone 331
 Tallman, Robbin and Co.
 loose-leaf binders 772, 774, 783, 786
 Tape sealing machines 13, 475
 Tate calculator 56
 Tatum, Samuel C., Co.
 loose-leaf binders 772, 774, 783, 786
 Taxes, figuring 100
 Telautograph Corporation
 intercommunicating systems 570
 Telautograph system 570-571
 Telegraph companies
see Telephone and telegraph companies
 Telegraph typewriter 13, 544
 Telephone 13
 and telegraph companies 542
 records and forms used by 45
 credit systems 13
 indexes 612
 manufactured by such companies as:
 Bates Manufacturing Co., The
see also Intercommunicating systems
 Tell City Desk Co.
 desks 731
 Temple-Stuart Co. 738
 chairs 738
 Tenacity Manufacturing Co., The
 loose-leaf binders 772, 774, 783, 786
 Tengwall Company
 loose-leaf binders 772, 774, 786
 Terrell's Equipment Co.
 lockers 743
 storage and supply cabinets 632
 Theaters, coin-changing devices 211
 Thomas, Charles Xavier
 calculating machine 56, 86
 Thonet Brothers
 chairs 738
 Thurber, Charles
 typewriter inventor 349
 Ticket-marking system 613
 manufactured by such companies as:
 Monarch Marking System Co., The
 Tickometer Co., The
 counting machines 590
 Tim calculator 56
 Time cards 447
 Time clocks 41
see also Time recording devices
 Timekeeping 540
 Time recorder
 the ancestor of the 7
 Time-recording devices 11, 510-540
 early experiments with 513-515
 early inventors:
 Bundy, W. L. 514
 Phelps, E. S. 514
 Wilson, John C. 513
 elapsed-time recorders 525-528
 employees' time records 518-520
 features common to 515-518
 job-time recorders 522
 manufactured by such companies as:
 Ajax Time Stamp Co. 521
 Automatic Time Stamp Co., The 513, 518, 521
 Calculagraph Company 525
 Cincinnati Time Recorder Co., The 535
 Detex Watchclock Corporation 521
 Ellis Time Stamp Co., The 518, 521, 522
 Follett Time Recording Co. 522
 Gisholt Machine Co. 519, 520, 532, 536
 Howard, E., Clock Co., The 525, 528, 536
 International Time Recording Co. 521
 Joslin, A. D., Manufacturing Co. 514, 528
 Phelps Guardant Time Lock Co. 528
 Recording Devices Co. 518
 Simplex Time Recorder Co. 518, 520, 522, 525, 532, 536
 Stromberg Electric Co. 528
 money-time recorders 536
 program instruments 537-540
 recording door locks 513, 520-522
 service rendered by 532
 time-stamps 535
 watchclocks
 electric 532
 portable 535
 watchman's recording equipment 531-535
 Time stamps 7, 12, 513, 520-522
 first patented in 1871 7
see also Time-recording devices
 Todd Company, The
 adding machines 71
 check protectors and writers 189, 190, 191, 196, 197, 200
 Toledo Scale Co. 498, 502, 504, 505
 Tonk Manufacturing Co.
 chairs 738
 Transcribing devices 366-370
 automatic envelope feeder 371
see also Typing aids
 Travelers' expense reports, proving 81
 Trays
 manufactured by such companies as:
 American Electric Co. 748
 Art Metal Construction Co. 748
 Browne-Morse Company 748
 Commercial Furniture Co. 748
 General Fireproofing Co., The 748
 Globe-Wernicke Co., The 748

- Library Bureau 748
Macey Company, The 748
Manufacturing Equipment and Engineering Co. 748
Orpin Company 748
Shaw-Walker Company 748
Sikes Company, The 748
Steel Equipment Corporation 748
Stow and Davis Furniture Co. 748
Wagemaker Company 748
Watson Manufacturing Co. 748
Weis Manufacturing Co. 748
Yawman and Erbe Manufacturing Co. 748
Trial balances 81, 98
Triner Scale and Manufacturing Co. 498, 502, 505
Trussell Manufacturing Co. loose-leaf binder 786
Trust department activities *see also* Banks 32
Tullius Tiro
use of shorthand 331
Typaddresser Company, The
addressing machines 434
Typewriter 11, 12, 13, 31, 346, 365
ancestors of the modern 346
automatic 395
carriage 356, 361
demountable 355, 359
first patent granted for a, in 1774 6
for billing purposes 103
keyboard 354, 360
manufactured by such companies as:
Corona Typewriter Co. 362
Demountable Typewriter Co. 354, 359
Hammond Typewriter Co. 351, 362
L. C. Smith & Brothers Typewriter Co., Inc. 354, 357
Oliver Typewriter Co. 362
Remington Typewriter Co. 351, 352, 354, 362
Remington Noiseless Typewriter Corporation 359
Royal Typewriter Co. 354
Smith Premier Typewriter Co. 354
Underwood Typewriter Co. 352, 354, 362
Victor Typewriter Co. 354
Woodstock Typewriter Co. 354, 359
motor-driven 357, 359
noiseless 356, 359
patents for typewriters and typewriter devices:
Burt, William Austin; American patent, granted in 1829 346
Gathright, Joseph B. 352
Glidden, Carlos; Sholes, Christopher Latham; Soule, Samuel W. 349-350
Gorin, F. P. 353
Hammond, James B. 351
Mills, Henry; English patent, granted in 1714 346
Projean, Xavier 348
Thurber, Charles 349
Wagner, Franz X. 352
platens 353, 357, 358
portable 362
present-day models 353-354
shift-key 351, 354
special keys 355
stands 745
manufactured by such companies as:
Weis Manufacturing Co. 745
Yawman and Erbe Manufacturing Co. 745
tabulators 352, 355
telegraph typewriters 568
the first, completed (1869) 7
the first office machine 6
Typing aids 366-373
copy-holders
manufactured by such companies as:
American Electric Co. 370
Error-No, Incorporated 366
Line-A-Time Manufacturing Co., Inc., The 366, 370
Nielson Supply Co. 366
transcribing devices 366, 370
U
Underwood Typewriter Co. 352, 354, 362
billing machine 107, 116
billing-machine forms 807
bookkeeping machines 147
stencil duplicators 382
Underwriters' Laboratories, Inc., The 622
Union City Chair Co. chairs 738
United Autographic Register Co. 254, 256, 257, 258, 259
autographic cash registers 257
billing-machine attachments 110, 112
billing-machine forms 803
credit register 303
United States Duplicator Co. gelatin duplicator 386
United States Senate dictating machines 333, 334
United States Sub-Treasury of Chicago 225
Universities *see* Institutions
V
Valley City Desk Co. desks 731
Van Dorn Iron Works Co. desks 731
filing equipment 671, 676, 678
safes 623
Van Horn, V. J., Co. sealing machines 476
Van Meter Chair Co. chairs 738
Vault protection 627-633
Vaults
manufactured by such companies as:
Diebold Safe and Lock Co. 628
Herring-Hall-Marvin Co. 628
Mosler Safe Co. 628
Remington and Sherman Co. 628
York Safe and Lock Co. 628
Vawter, William A. inventor of early loose-leaf ledger 763
Victor Adding Machine Co. 75
Victor Safe and Lock Co. safes 623
storage and supply cabinets 632
Victor Typewriter Co. 354

- Vincent, Jess G.
non-add symbol printer 63
- Visible indexes 13, 665
- Visible index systems 13, 27, 696-718
- early experiments with 696
- four types:
book-unit 713
cabinet 700
card drawer 711
upright 711
- manufactured by such companies as:
Accounting Devices Co. 713
Aluminum Company of America,
The 700, 711
Globe-Wernicke Co., The 700, 713
Kardex Rand Co. 704, 705, 711, 713
Library Bureau 700, 705
Postindex Company, Incorporated 700, 704, 711, 713
Ross-Gould Co. 700, 710, 713
Visible Records Equipment Co. 713
Weis Manufacturing Co., The 700, 709
- why they make records more valuable 716
- see also* Filing equipment
- Visible Records Equipment Co.
visible index systems 713
- W
- Wagemaker Company
chairs 738
desks 731
filing equipment 671, 676
Wage records 717
- Wagner, Franz X.
inventor, visible typewriter 352
- Wales Adding Machine Co. 75, 77
adding machine-cash register 317
- Washburn Company
wire mesh trays 750
- Watchclocks
electric 532
portable 535
- Watchman's recording equipment 531-535
- Watson Manufacturing Co.
desks 731
filing equipment 671, 676, 678
tables 742
- Wax sealing machines 13, 479
- Way-bills 443
- Webster Manufacturing Co.
chairs 738
- Weights and quantities, figuring, on bills 100
- Weis Manufacturing Co.
bookcases 743
filing equipment 671
typewriter stands 745
visible index systems 700, 709
- Welch, W. M., Scientific Co.
chairs 738
- Western Electric Manufacturing Co.
intercommunicating system 564
- Western Furniture Co.
desks 731
- Wetmore
adding machine keyboard 62
What is *systematization* in business? 20-21
- Whitaker, O. B. Manufacturing Co.
automatic "ad"-stamper 583
- Wilson, James C.
Wilson Jones Loose Leaf Co.
loose-leaf binders 772, 774, 783, 786
- Wire-line carriers 13, 571-572
- Woodstock Typewriter Co. 554, 359
- Workman Manufacturing Co.
loose-leaf binder 772, 774, 786, 793
- Writing machine
see Typewriter
- X
- Xenophon
use of shorthand 331
- Y
- Yawman and Erbe Manufacturing Co.
bookcases 743
desks 731
filing equipment 671, 676, 678
safe 623
storage and supply cabinets 632
tables 742
typewriter stands 745
- York Safe and Lock Co.
safes 623
safety-deposit boxes 633
vaults 628

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